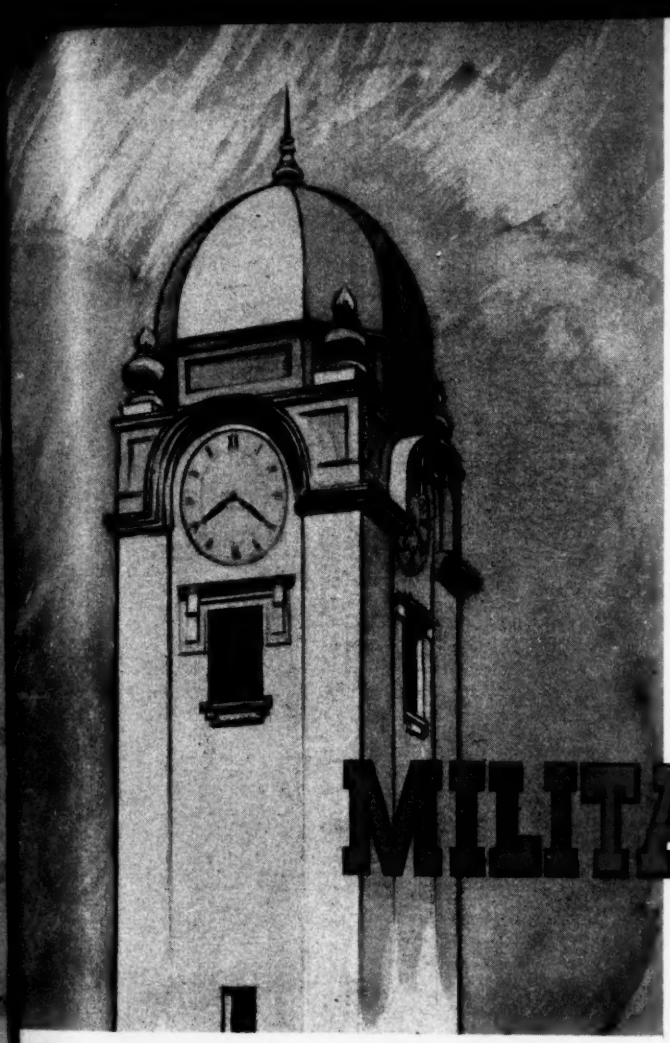

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MILITARY REVIEW

COMMAND AND GENERAL STAFF SCHOOL
Published at Fort Leavenworth, Kansas

A MONTHLY REVIEW OF MILITARY LITERATURE

JUNE • 1943 • VOL. 23 • NO. 3

Volume XXIII
1943

Number 3

COMMAND AND GENERAL STAFF SCHOOL

MILITARY REVIEW

MONTHLY REVIEW OF MILITARY LITERATURE

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June 1943

THE COMMAND AND GENERAL STAFF SCHOOL MILITARY REVIEW — Published monthly by the Command and General Staff School at Fort Leavenworth, Kansas. Entered as second-class matter August 31, 1934, at the Post Office at Fort Leavenworth, Kansas, under the Act of March 3, 1879. Subscription rate: $3.00 per year for 12 issues in the United States and possessions. Foreign subscriptions $4.50.

Acknowledgment

The editors desire to express their thanks and appreciation to those persons who have valuably assisted in the preparation of material for this issue. The work of contributors has been done in addition to their regular duties and gratuitously on their own time. We are very grateful to the following officers for their generous donations:

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Aviation in Support of Ground Troops

COLONEL WILFRID H. HARDY, *Air Corps*
Instructor, Command and General Staff School

ALL OR ANY part of the AAF may be used to support ground troops either under an appropriate field commander or under an air force commander. To refresh your memory, Figure 1 shows the organization of an air force. This organization is and must remain, very flexible. In a theater of operations will be found one or more such air forces. They need not all have the four standard commands in each case. We could have an air force containing say two bomber commands while some other air force could have two air support commands. Within each air force, units may be shifted around according to the need. For instance, an air support command might have need of medium bombardment units for some particular mission. If that were the case, the medium bombardment units could be lifted out of the bomber command and attached to the air support command. If that were not possible, due to the lack of either control or base facilities, then the task would have to be performed by the bomber command for the air support command.

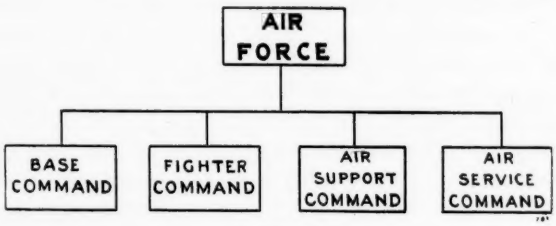

FIGURE 1.

Whereas the designation of the general line of action, or mission of the AAF, is a function of the War Department, the capability to execute a mission will, of course, vary with each command, due to its equipment and training. But each command should be employed so as to furnish the maximum support, each class of aviation being employed against targets best suited to its characteristics. Properly located, adequately supplied, and well defended air bases are absolutely essential to air operation. They not only furnish a starting point but extend the striking power or range of our bombers. This range should always be greater than the maximum effective range of the enemy's striking force.

As a vehicle of our discussion we will use an air force, because in it are contained all of the elements of aerial combat. We will give it to, say, a theater commander. It's job will be to support the ground forces in this theater and absolutely nothing else. Do not confuse air support with independent air force operations; that can be totally separate and conducted from the same or from some other theater. Our very first step must be to form an aviation plan of support, and this plan must be based on the plan of action of the supported unit.

But first of all, what is support? It may be defined as help or assistance to someone in carrying out a mission, and a mission involves a purpose to be achieved in a certain period of time. The time is either designated or implied in the mission. Note that there is no distance or contact involved in this definition; so whatever can be done to help accomplish a mission is support. It does not matter one bit whether the job is accomplished close to, or distant from, the supported force, nor is it necessary that any part of a helping force be seen or heard by the element to be helped. It is all a question of capabilities and time. When everything is said and done, we all agree that military efforts have but one goal—that is to break the enemy's will to resist—and to that end the air is no exception.

Bearing the above in mind, and only for the purpose of analyzing, we will divide support into two classes. The first we will call general support. You could call it distant support, or, in some cases, strategic support. It may be defined as support which is planned and ordered by the higher headquarters for the benefit of a large command. It is a part of the general plan of the commander of the supported forces. Much of this class of support will be executed at some distance from the immediate sphere of influence of ground forces. Some will ordinarily precede the contact phase of ground forces, or at least the major engagements, and of course, it may have to be continuous during a campaign. But all of the operations engaged in by supporting aviation must be pointed or directed with the one thought in mind—of furnishing the maximum help at a particular time or over a period of time.

Under general support the first and very basic mission to be accomplished is that of counter air force operations. The goal of this mission is the total destruction of all of the enemy's air force or his capability to replace that equipment. We would like first to destroy his factories so as to deny the equipment at its very source; but this is seldom attainable, so counter air force operations must be carried out progressively against his aircraft on the ground or in the air. The successful accomplishment of this task would result in that all-important condition called "control of the air." This control or dominance of the air has now pretty well become the

foundation or road for all other operations, either on the ground, in the air, or on the seas. Gaining control of the air is by far the very best way of supporting ground forces. Specifically:

a. It would deny to the enemy the use of a weapon which we ourselves want to employ.

b. It would remove the threat of air attack from our troops or from our installations.

c. It would permit the easy handling of our troops and supplies. Our movements could then be largely by daylight instead of confined to hours of darkness, and our columns could be of normal length instead of stretched out three or four times their normal length. Everything could be handled much easier and faster.

d. The work of our observation and reconnaissance agencies would be much easier and would facilitate gaining the all-important element of surprise. Just imagine, for example, how well off you would be if the enemy had no aviation and your own observation could operate at will.

There is still another benefit to be derived from counter air force operations and it is sort of a double-edged affair due to the fact that aviation threatens everything within range. For instance, aviation stationed right here at Sherman Field would threaten equally well the towns of St. Louis and Wichita, lying in opposite directions and separated by about four hundred miles. If they were held by the enemy and contained vital objectives, he would be forced to keep some part of his troops and supplies at those places for their defense. The mere fact that aviation is at Sherman Field would impose that condition on that enemy without our actually conducting a single mission; simply because aviation threatens everything within range. Naturally, since the enemy would have no aviation to threaten our own installations, if our counter air force operations had been successful, then we could release our troops and supply from duty in the rear areas and employ them to much better advantage in the combat zone. You see, we gain both ways providing we have successfully carried out counter air force operations.

Gaining air advantage is always the primary mission of all air forces. To the ground commander it furnishes security and facilitates offensive ground action.

The second part of general support is the delivery of air attacks against objectives on the surface of the earth. Those objectives must be carefully selected with the view of rendering the greatest amount of support at any particular time. There is absolutely no purpose, or anything to be gained by the indiscriminate bombing of everything in sight. Every bomb should be aimed at something the destruction of which will benefit our forces. Moreover, the vital targets should be selected for attack in order to furnish the maximum help. And to find out when a target is vital takes a careful and running estimate of the situation. The supported commander should select or pick out the system of objectives, the destruction of which will be the greatest help, and then the selection of targets within that system should be left to the air commander. It then becomes the job of the air commander to develop the designated system of objectives and attack the proper targets within the system in order to obtain the desired result. By developing a system of objectives, we mean the study and location of the sensitive points that are vulnerable to air attacks.

For example, let us say that in the area of influence of a theater commander there is a town such as Kansas City. Without very much trouble we could easily find that such a city had the following possible targets: (1) an airplane factory, (2) important bridges, (3) oil refineries, (4) a shoe factory, (5) extensive railroad yards, and (6) an ammunition plant. Obviously any one of these, if destroyed, would contribute to our success. For example, if we destroyed the shoe factory, then the enemy, since he would lack shoes, would be less able to resist us; but that need not tend to end a campaign very quickly. The important point to remember is that the one vital system should be designated at the proper time. At the beginning of operations, the airplane factory would certainly be in very first priority because of the counter air force mission that we just talked about. But this airplane factory need not remain in first priority throughout an extended campaign. For example, when the theater commander decides to attack on some part of his front, perhaps the biggest contribution to the success of the attack could be made by the air if means of transportation were denied to the enemy. Of course the plan would then be to prevent the arrival of reinforcements in time and at the place where our attack is to take place. If such a scheme of operations were adopted, then the theater commander might designate the transportation system as the one to be worked on by the air. Now the air commander could select for attack any one or more of several points in the transportation system. If an important bridge were destroyed it might prevent the movement of troops for some time, so perhaps that is the point that would be attacked. But it must be remembered that if a bridge is that important, the enemy is likely to defend it heavily, and its destruction by air might be a very expensive proposition. So the air commander continues to study the transportation system, and in this case would find extensive railroad yards that are comparatively easy to hit from the air. Moreover, they are very vulnerable even to the smaller types of demolition bombs. Also their destruction would be quite permanent because the switching facilities of a railroad cannot be repaired in a very short period of time; and the dislocation of a rail center such as Kansas City would un-

doubtedly be felt all over the United States. But let us suppose that even the rail center is so well defended that the job would be too expensive. Then perhaps the air commander would be forced to cut individual rail lines lying outside the defended area. This, of course, would not be as easily done since many rail lines exist, and furthermore the attacks would have to be repeated since repairs would probably take place fairly rapidly.

At some other time the theater commander might designate the supply system. In that case the air commander might attack the oil refineries or the ammunition plant. The oil refineries are very vulnerable to even small types of bombs. On the other hand the ammunition plant is quite another story. The buildings and shops themselves might be attacked from a very high altitude because they are extensive. Production could be greatly decreased or perhaps stopped entirely; but it would not take away the supplies which might be stored in the nearby magazines. The attack of the magazines themselves would be a very difficult task because they are made of reinforced concrete and are well dispersed and well camouflaged. Each individual magazine probably could stand several direct hits by medium sized bombs.

The individual targets in any system of objectives would be selected by the air commander, taking into consideration the capacity of his force, the degree of vulnerability of each target, and the time available. It may be that attacks will have to be repeated in order to maintain a sufficient degree of destruction or neutralization.

The task of counter air force operations and air attacks are executed largely by the first two commands of an air force, that is, the bomber command and the fighter command. The bomber command, as you know, is the basic part of an air force. It is the backbone of any air force because it is the striking part. It's offensive weapon is principally the aerial bomb, of which there are four kinds—the demolition, the fragmentation, the chemical, and the incendiary. Bombs of all sizes up to 4,000 pounds and containing approximately sixty-five percent explosives are available in the service. A bomb of appropriate size is capable of destroying, or effectively neutralizing, anything on the surface of the earth. Some types of bombers are used for low altitude attacks and in that case their machine guns also become offensive weapons, but for all operations at higher altitudes the machine guns on bombers are purely for defense. Bombardment never fights offensively in the air, it seeks to avoid combat, and usually flies in formation to afford mutual protection. Bombardment is ordinarily sent out on specific missions—that is, we prescribe the objective, the routes to and from the objective, the time of attack, the altitude, and direction of attack (all items not necessarily prescribed).

The fighter commands operate the type of aviation which is designed primarily for air fighting. It is very seldom used against ground targets, but can be used when the situation is either very favorable or very critical. For example the Germans used their fighters against troop columns during the Greek campaign because, first of all, there was no opposition in the air, and secondly, the several machine guns on that type of aircraft are effective against such a target. In a situation which might become so critical that everything would have to be thrown at the enemy in order to save the situation, of course fighters would go out just the same as anything else. Whereas the missions of bombardment are very specific, those of fighters should be more general. Because of their superior performance in speed, climb, and maneuverability, they have the initiative. That is, they can start or stop a fight whenever they so desire. They can attack at the time of their own choosing, and from the direction which they choose. The initiative is a tremendous advantage in air fighting, and ordinarily no mission should be assigned to fighters which would tend to take away this initiative. Remember that nothing has yet been found to stop an air attack—that to date fighters have been the most effective counter-agent. You should keep them so by giving as broad missions as possible.

The second type of support which we shall analyze is direct support. It may be defined as air operations against troops in contact, or capable of interfering with the mission of the friendly troops.

This type of support cannot always be anticipated and calls for quick decisions and actions. It is a special phase of air operations which needs careful coordination and close control. The communications must be rapid and absolutely positive. Simple but effective means of designating targets and identifying troops must be pre-arranged. Speed and accuracy in orders, in communications, and in operations, is the very essence of this class of support. Some of this support may take place on the immediate front or flanks of a unit, and some of it may take place in areas more removed from the supported unit.

In the employment of aviation in the support of ground troops, it must be appreciated that

a. The hostile rear area is the normal zone of operations for aviation. There are two reasons for this. First, that is where all threats originate, and secondly, all targets in the rear areas are more concentrated and therefore more vulnerable to air attack.

b. Aviation is a theater of operations weapon. If bases are available the whole aviation effort can be more quickly concentrated and used against a vital target than anything else.

c. The field of operations must not be restricted. It must be kept sufficiently extended to take advantage of range, speed, and flexibility.

d. Like any other weapon, it should be employed *en masse.* Mass employment requires large num-

bers, or the repeated use of small forces. When the amount of aviation is limited, the rate of employment must be carefully watched so as to have the maximum amount available at critical times.

Targets will appear literally by the thousands, as practically anything on or near the battlefield may be a proper target. You should be careful, however, about accepting targets simply because they are profitable. They need not be good targets at all. What you must do is look for the vital target; and that is the one which is the most dangerous to your command at any particular time. Rather than expend your aviation on doubtful targets, you should wait until a really important one is found and then hit it as hard as possible.

All of the above considerations mean but one thing, and that is "centralized control." For the support of ground troops we believe that the control of aviation should be initially exercised from the army, because all parts of an army can usually be properly supported from there. To decentralize would invite dispersion of effort and waste of aircraft. The air support commander decentralizes only when he is no longer able to control his units properly. That may happen because of communications difficulties, because of distance, or because closer cooperation and association can be had by the ground and air.

This support that has been called direct support is executed by the air support command. This is the command which has the primary function of supporting ground troops, and is the one especially trained and equipped for this task. In addition to what might be termed service aviation, such as observation and transports, the air support commands may have two types of light bombers. First, the horizontal (present A-20 type) attacks targets from a horizontal or gliding attitude, and employs a bombsight. Because of it's greater speed, greater bomb load, and lack of close-quarter maneuverability, we say that it is best suited for the attack of area targets, although there is no iron-bound rule. These targets could be troops in column or concentrated. They could be artillery in position, or they could be ammunition dumps, etc. The present A-20 can be loaded with fragmentation bombs or demolition bombs. These two bombs are the ones most commonly used in support operations; the 30-pound fragmentation being very effective against personnel up to 75 feet, and the 100-pound demolition is effective against practically anything movable which is likely to be found on the battlefield. The smallest area that can be covered by a squadron of nine planes in salvo bombing, from one formation, is approximately 1000 by 80 yards.

The dive bombers attack objectives from a dive and employ no bombsight, but use the airplane itself as a sight. Because of its high speed of attack, its rapid rate of descent, and it's greater maneuverability, we say that it is better suited for the attack of precision targets. Remember that it can corkscrew around during the first part of the dive and change altitude so rapidly that it is a very difficult target for anti-aircraft weapons except possibly those that are right on the target. Precision targets might include small bridges, practically any type of small field fortifications, command posts, tanks, etc.

Targets not suitable for any type of aviation include all small or well-hidden targets. No target can be hit from the air unless it is visible to the crew.

One principle relative to the employment of aviation in support of ground troops can be stated about as follows: "Except in emergencies, aviation will be employed beyond the effective range of friendly artillery." To understand this principle and all it's implication takes at least a short analysis and comparison of artillery and aviation. In Figure 2 is shown an artillery piece. This gun is capable of affecting anything within it's range. Moreover, it has

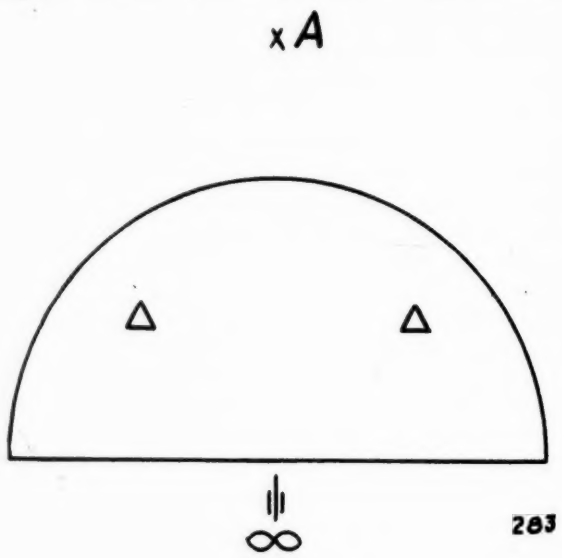

FIGURE 2.

many advantages. First of all, it has a very stable platform; then, volume or continuity of fire is obtained by the expenditure of ammunition. Also, this gun is capable of firing not only during hours of daylight but also during darkness, during rain, snow, sleet, or any other kind of weather conditions. It is, of course, incapable of reaching some target which is beyond its effective range. Moreover, it is a weapon which is ordinarily close to troops, and can usually be figured as available. By that I mean that if a combat team commander is told by his division commander that, for his attack plan the next day, a battalion of artillery will be available, then certainly the combat team commander can be reasonably sure that that artillery will be available to him when the attack jumps off.

On the other hand, the airplane shown here is also

capable of affecting any target within the range of the gun; but it is also capable of taking on a target far beyond the range of artillery. But it must be remembered that once the airplane has dropped its bombs on this target, the airplane is of no further value to anyone until it has returned to a base and been rearmed and reserviced. In other words, the fire is less continuous. Again, this airplane, while going to or returning from this mission, is subject to interruption by weather or enemy action. It's subsequent employment can never be predicted very far ahead. The airplane is also more expensive and less easily replaced than artillery, and while it is true that airplanes can attack anything, also remember that it is very difficult from an airplane moving at four or five miles a minute to recognize small terrain features that are easily distinguishable to ground personnel.

This comparison would tend to indicate that what we should do would be to acquire enough artillery to take care of everything within the range of those weapons and to reserve the aviation for targets that lie beyond the range of ground weapons. That is exactly what our principle states; but there are exceptions. In the first place, any main effort will always require the massing of artillery fires in some area to favor the main attack. If we mass the fire in one area, it leaves some other area comparatively free of fire, and if some target in that area must be kept under fire, then it is perfectly proper to use aviation for that purpose. Note, however, that the reason for using aviation here is that there is an insufficient amount of artillery, and that, if it is true that there can never be enough artillery, it is also true that there can never be enough aviation. The second exception to our rule involves the element of time. Let us say that well within the range of artillery there is some target which could be destroyed by that weapon if we gave it enough time to work on it; but let us suppose that the commander prescribes that this target be destroyed in much shorter time than

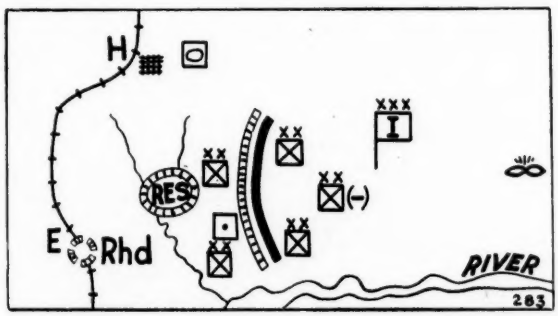

FIGURE 3.

can be accomplished by artillery alone. Then, of course, we would place both artillery and aviation on the very same target for the purpose of attaining the necessary destruction in the given period of time. Our third exception is that there may be targets within the range of artillery which are not susceptible to destruction by that weapon—for instance, heavy masonry, or targets on the reverse slope of a hill. Aviation, because it can approach from any direction and can carry heavy bombs could take these targets as well as any others.

Here is a little problem to illustrate what is meant by vital targets. Here we picture a corps attacking in a westerly direction (Fig. 3). We will suppose that this action has been going on for some few days. Today the corps commander, who is planning to attack tomorrow morning from his north flank and in a southwesterly direction, is told by higher authority that Red is capable of being reinforced during the night by either armored or motorized units. He is also told that he will be furnished one aviation unit, say a group, by daylight tomorrow, and that this group will be available for him for one mission only any time after daylight tomorrow morning. Now, let us move the situation to say 7:30 tomorrow morning. The attack was resumed soon after daylight, which was 5 o'clock, and the corps attack is making satisfactory progress. By 7:30, information was received at corps headquarters that the three following targets have been located. Close to our front has been located a large groupment of artillery and, for the purpose of our little problem, we will say that they are well bunched up and, of course, firing upon our troops. A little farther back there has been located in this area a large reserve that we will say consists of at least a brigade and perhaps more—again a large group of men, well bunched up, in a very small ravine. Still further back our observation reports quite a traffic jam at the little town of "E." Some three or four hundred trucks are double or triple banked on the road, presumably drawing supplies. Remember that the aviation is available for only one mission, and that we were told that Red could be reinforced during the night; the question is would you, as corps commander, employ your aviation at this time against any one of these targets, and if so, which one?

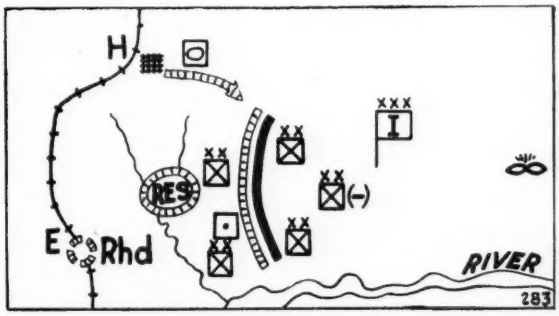

FIGURE 4.

Under the conditions stated, it is believed that none of the targets named should be accepted now, because they do not constitute vital targets. It is true that all three are very profitable targets, but not a single one of them is, at this time, dangerous to our command; and if our aviation is employed against any

one of them it will, of course, not be available later on. In war it is likely that there will always be artillery firing at our troops, and that the enemy will have reserves in the rear areas, and rail heads will probably operate at some time.

Let us move the situation to, say, 9 o'clock. At that time a Red armored division force is discovered emerging from the town of "H'" where evidently it had been hiding (Fig. 4). There is a target coming right at our flank, which is dangerous to our command. If that target is not opposed our entire command is likely to suffer severely. This is the vital target against which aviation should be employed. It is true that tanks, moving at speeds of up to 25 miles per hour, if well dispersed and separated by at least 200 yards, constitute a very poor target for aviation since they are extremely difficult to hit from an airplane. The point is, however, that this target must be opposed, and that nothing else but aviation is capable of opposing it at this time. You see, we have passed up three very profitable targets for the sake of getting to a vital one.

Another point about this little problem has to do with air-ground cooperation. Initially the armored force would be opposed by aviation—but later when the tanks come within range, they should be opposed by ground weapons.

This article is taken from a conference presented at the Command and General Staff School. A further discussion of this subject will appear in the next issue.

Battle Schools

There are two types of person less knowledgeable than they suppose who have a lot to say about the training of Britain's fighters. The first places all the emphasis on the training given to Special Service troops—the men who form the Commandos. The second will tell you that what he calls "Commando training" is now general throughout the Army.

Both are wrong: the first because there is as much to be said about the training of any infantry unit as there is about that of a Commando; the second, because "Commando training" is specially designed for men with a particular job to do, and is therefore not general in an army made up of countless units serving a great many functions. It is obvious, for instance, that the men who go on Commando raids have certain special problems of embarkation and disembarkation to surmount, and that much of their training must be devoted to giving them a mastery of these problems.

What is true is that every unit of the Field Army today has intensive and ruthless training under most realistically war-like conditions. In its ruggedness, in its call on a man's powers of endurance, the training of the average infantryman is comparable with that of the Commandos.

Today this grim, searching training is conducted on a very large scale. All field units, infantry, privates and senior officers alike, are passed through the new Battle Training Schools, now established on the basis of one to every infantry division. Two particular advantages accrue from this system: first, the initiative of all troops is developed to the uttermost: and secondly, the large-scale exercises in which whole army corps cooperate teach every man the sort of part he will be called on to play during battle.

The exercises are full-length, realistic affairs. They last for several days and reproduce accurately the conditions under which modern war is waged. Tanks support infantry divisions. Parachute and glider troops come into play. Bombers, army cooperation squadrons (Special airforce units equipped for and allotted to duty with the army.—Ed.), units of the Royal Navy take part in the operations. The aggressive spirit is fostered, and troops are toughened by invasion practices, cliff-scaling, rock-climbing, swimming rivers in full kit, and marching set distances at top speed. Infantrymen must show themselves at home with British and foreign maps. They have to destroy antitank mines and barbed wire. They master the arts of assault, bridging, and street fighting, and learn how to recognize aircraft and detect camouflage. During an exercise they double round a course, bayoneting and firing at dummy targets hidden behind trees and bushes.

Such displays of aggressiveness are often staged in realistic conditions, live shells, grenades, and cartridges being used. On a recent occasion an advance was made by tanks and infantry behind a creeping barrage from a field artillery regiment.

The rigorous and intensive training of the infantry differs from that undergone by men in Special Service units, but the way in which these soldiers stood up to the ordeal of Dieppe, shoulder to shoulder with men of the Commandos, shows that the severity is equal, and that both kinds turn out men who will not falter or quail, however perilous the task they are set. (From *The Fighting Forces*, Great Britain, December 1942.)

Military Relations with Civilian Defense

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MUCH has been written in the last three years about the "new" type of war now being waged—a war in which every member of a belligerent nation becomes in fact a participant, in which all of a country's forces are marshalled and directed against the most vulnerable elements of the enemy's material and moral strength. This conception of war is not new but is merely an up-to-date version of "the law of the jungle." The methods of warfare used by our enemies contemplate the use of every means—including the most effective ways to damage, destroy and kill—not only to defeat our army and navy, but also to create terror and havoc, panic and suffering among the non-combatant population. Their aim is the disruption of production, the undermining of the fighting forces, the destruction of national morale and the unconditional surrender of our government. The headline writers have a name for this—"Total Warfare."

For every new type of offensive, an adequate defense is, in time, developed. The answer to Total Warfare in which we are engaged today is a complete, all-inclusive system of Total Defense. Such a system will include both active and passive measures.

Naturally, active defense is the duty and responsibility of the armed forces and their primary mission is to meet and defeat the army, navy and air force of the enemy. An additional important responsibility is the protection of vital installations in the Zone of the Interior from air attack by maintaining an aircraft warning service and by operating all types of antiaircraft means—antiaircraft artillery, fighter planes and balloon barrages. The prevention of sabotage and protection from injury or destruction of national defense materials, premises and utilities is shared by the armed forces and Civilian Defense. An Executive Order (No. 8972) dated 12 December 1941 imposed a large measure of this responsibility on Corps Area (now Service Command) Commanders.

But the big job in the Zone of Interior is passive defense—or as we will call it—Civilian Defense. Civilian Defense is not aimed or directed actively against the armed forces of the enemy. It includes measures which seek to limit the effect of hostile action—fires, explosions and gas dangers caused by aerial bombardment—so that such activities are not profitable to the enemy. It embraces the air raid precautions necessary for insuring the safety of persons and property so as, in turn, to insure continued uninterrupted operation of defense industries. The responsibility for civilian protection—for passive defense—rests as squarely on the civilian population as does the accomplishment of active defense on the armed forces. From the broader viewpoint, *Total Defense* imposes a *joint* responsibility for unified cooperative action on the armed forces *and* the civilian population.

To meet this responsibility squarely and to *accomplish* Total Defense, both elements must know the responsibilities, capabilities and limitations of the other. In order to understand present and potential "Military Relations with Civilian Defense," we should know clearly the development, organization and functions of the several phases of civilian defense—and the present setup of the important activities. A very close relationship exists between the Army and Civilian Defense and there are many points of contact between these two important factors in our "Total Defense."

In July 1940 the War Department directed the nine Corps Area commanders to advise and assist the states and the principal municipalities in their areas in organizing civilian protective measures. In early 1941, the Division of State and Local Cooperation within the Council of National Defense distributed a memorandum entitled "Basic Plan for Civilian Defense" which had been prepared by the War Department. By April 1941 Councils of Defense, or Defense Coordinators, had been established in forty-four states and more than one thousand communities, but much of the program existed only on paper and lacked both coordination and public enthusiasm. Based on the principle and general program of the War Department's "Basic Plan," an Executive Order dated 20 May 1941 established, within the Office for Emergency Management, the Office of Civilian Defense. The original purposes of this office were: "(1) to assure effective coordination of Federal relations with State and local governments in defense activities, (2) to provide for necessary cooperation with State and local governments in respect to measures for adequate protection of the civilian population in emergency periods, (3) to facilitate constructive civilian participation in the defense program, and (4) to sustain national morale."

The general organization of the OCD was set forth in the initial executive order, and although there have been some amendments and changes in that order, the basic principles remain the same. The present framework of OCD is indicated on Figure 1.

The Director is responsible directly to the Presi-

dent; he is also Chairman of the Board for Civilian Protection. The function of the Board is to assist and advise the Director; it consists of the Secretaries of War and Navy, the Director of Defense Health and Welfare Services, the Attorney General, and repre-

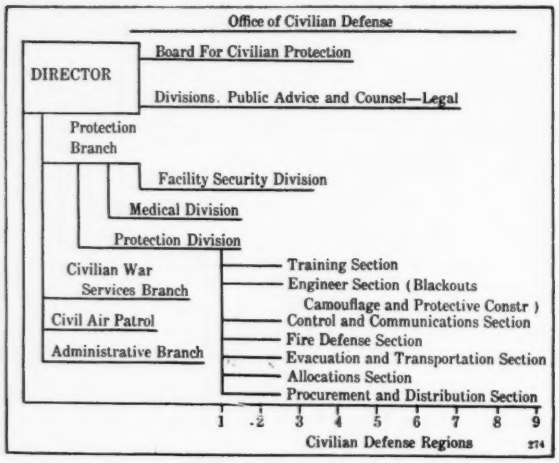

FIGURE 1.

sentatives of the American Municipal Association, the U. S. Council of Mayors, the Governors' Conference and the American Red Cross.

The Civilian War Services Branch is concerned with developing plans for the guidance of local Defense Councils in mobilizing all of the resources of their communities, including volunteer manpower. The War Service Staffs of the Regional Offices of the nine Civilian Defense Regions work directly with state Defense Councils, giving organizational advice and counsel in matters of state and local organization. Through its Defense Council Division, the Branch provides leadership in the development of Defense Councils through which local communities coordinate both the protective services needed in case of enemy action and the civilian war services such as salvage, sale of war bonds, day care for children of working mothers, and recreation for service men. Through its Organizations Division, the Branch develops plans for allying the strength of organized groups with local Defense Councils and their projects.

The Army has been particularly interested in two of the major branches—Civil Air Patrol, and the Protection Branch.

The Civil Air Patrol was organized December 1, 1941, with the approval and cooperation of the War Department and now embraces twenty thousand experienced pilots with thousands of planes. These volunteers are called on to perform in-shore submarine patrol duty, courier service, observation of blackouts, towing of targets and many other "pick and shovel" jobs. The Army Air Forces have been saved many hours of flying at the expense of a few Warrant Officers, armorers and mechanics who man some of the Civil Air Patrol fields. About one-third of the army officers on duty at National Headquarters of OCD are in the Civil Air Patrol.

The Protection Branch (formerly the Division of Civilian Protection) has always been the Army's "baby." Since the formation of the OCD the Assistant Director of Civilian Protection has been a General Officer of the Army. Nine officers were originally detailed for duty with the OCD and this number was later increased to seventy; of the latter, fifteen worked in the National Office while the remainder were assigned to the Regional Offices. There are now 26 officers in the National Office (aside from the Civil Air Patrol) and on Dec. 24, 1942, the allotment of officers for duty with OCD, exclusive of Civil Air Patrol, was fixed by the Secretary of War at 71. The Assistant Director in charge of Civilian Protection and an Executive Officer now head the Protection Branch while army officers are in charge of the Engineering Section (research for which is conducted by the Engineering Board at Ft. Belvoir), the Evacuation and Transportation Section, the Procurement and Distribution Section (responsible for the procurement and shipment of the $100,000,000 of protective materials—auxiliary fire apparatus, gas masks, medical supplies, helmets—to be lent to the local Civilian Defense groups), and the Training Section (which prepares training instructions and handbooks to be used in training members of the Citizens' Defense Corps). Fifteen officers are in charge of the Facility Security Division—eight in the National Office and seven in the field. This Division is designed to assure the development and execution of measures for "the protection of essential facilities from sabotage and other destructive acts and omissions." It also serves as the center for coordination of plans sponsored or operated by the various federal departments and agencies and maintains liaison with the Service Commands.

By an early administrative order, Mr. LaGuardia, the first Director of OCD, decentralized the work of the national office by establishing nine Civilian Defense Regions, coterminous with the nine Corps Areas (now Service Commands). The Regional Directors were appointed by, and are employees of, the National OCD. It should be emphasized that the line from the National Director to each Regional Director is one of command. The regional offices, suboffices of the national OCD, were set up in the general form as shown in Figure 2.

Regional Boards for Civilian Protection bear the same relationship to the Regional Directors as the national Board bears to the National Director—advice and assistance only. The regional Board is composed of field representatives of the federal departments and agencies represented on the national Board. In July 1941 the War Department directed Corps Area and Air Force commanders to appoint officers to represent them on the regional Boards for Civilian Protection; these representatives were also

to act as liaison officers between their respective commands and the regional Boards. The following instructions accompanying this directive are interesting:—"no attempt should be made by Corps Area Headquarters or other echelons of the Army to pre-

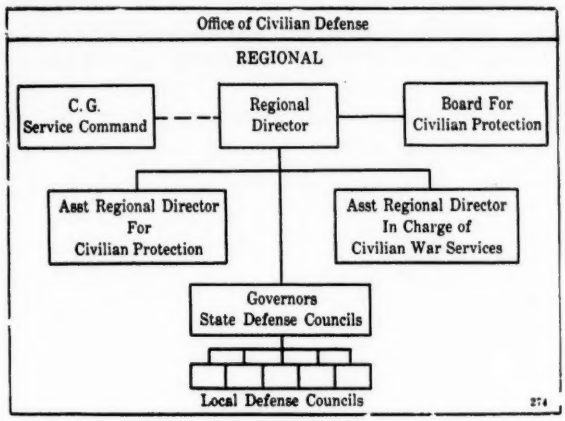

FIGURE 2.

scribe the duties and functions of this Board or any other activity under the jurisdiction of the regional Office." In all but one of the Civilian Defense Regions this representative of the Commanding General, Service Command, became Assistant Regional Director in charge of Civilian Protection. Originally, the bulk of the army officers detailed to OCD were in the regional Offices and, specifically, in the Civilian Protection Division thereof. They took orders from the Assistant Regional Director in charge of Civilian Protection and not from the Commanding General, Service Command. The jobs of these officers embraced:

(1) Advice to local defense councils through state councils on organization, training, testing and operation, and

(2) Inspection and checking for the Chief of Branch in the national Office.

They exercised these functions as experts, as assistants to Assistant Regional Directors in Charge of Civilian Protection—not as army officers or representatives of the Commanding General, Service Command.

The relationship between the Army and the Civilian Defense organization was described by one Corps Area commander as follows:

> "In Civilian Defense . . . the CG of the Corps Area is interested in results and to this extent maintains close observation over these activities . . . Corps Area is (not) indifferent to the efforts of our civilian populace and is prepared at all times to lend assistance or to give advice if requested . . . These Headquarters have no responsibility from a supervisory standpoint but merely advisory, and only then when requested."

It is interesting to note that the power and authority of the OCD—as set up 20 May 1941—was exactly the same as that given to the Corps Area commanders by the 1940 War Department directive—"to advise and assist, when requested, state and local governments." This was natural when we see that one of the original concepts of the local defense organizations was "a civilian force of volunteers supplementing and reinforcing, as far as possible, the established fire, police, and medical services of state and local governments." This concept was in turn based on the knowledge that the power to promulgate and enforce protective measures springs from state legislation and municipal ordinances. As a result of the absence of central authority, each community was autonomous in deciding whether it would have an organization, and if so, the form of organization, membership rules and training programs.

As Figure 3 suggests, it was originally contemplated that the governors would be instrumental in developing the state Civilian Defense Councils, and that mayors or local authorities would have an important part in forming the local Defense Council.

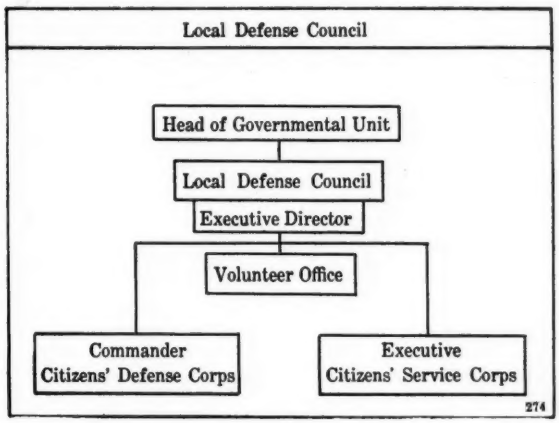

FIGURE 3.

Consequently, politics has, more than once, "reared its ugly head."

As the organization of Civilian Defense progressed, differences in setup, standards of membership, and degree of preparedness—as between various political subdivisions—became apparent. At the same time, it was realized that Axis planes would not bomb New York harbor in accordance with borough, township, county and state lines. To function properly, protective forces of any community should be organized on sound military lines—with a commanding officer, assisted by a staff, exercising direct control through subordinate commanding officers of the various Civilian Defense agencies. Uniformity in organization is desirable since one community may be called in to help out a neighboring community which has been bombed. Moreover, military units which may operate in any section of the country can cooperate more effectively if they can expect the same type of Citizens' Defense group everywhere.

In order to achieve this uniformity, Mr. Landis, the present Director of OCD, in April 1942 took ad-

vantage of a new federal statute and made official the U. S. Citizens' Defense Corps. His administrative order set up certain requirements as to form of organization, membership eligibility, training procedure and standards of performance. If the defense corps or protective organization of a community does not comply with (1) the official "approved solution" of organization (Figure 4), and (2) the prescribed standards and procedures for individual members in the Citizens' Defense Corps, it will not, in the words of the OCD regulation, "be an integral part of the U. S. Citizens' Defense Corps of the OCD." This means that (1) its members will not be entitled to wear or use prescribed and potential OCD insignia, (2) the organization will forfeit its right to receive and use protective supplies and equipment now being lent by OCD, and (3) Civilian Defense workers *may* not be eligible for civilian war aid, such as medical care or death and disability benefits. Consequently, it would appear that the OCD finally has attained reasonably potent means of enforcing its directives.

Figure 4 shows the approved organization for a local Citizens' Defense Corps—with the control center (corresponding to a military headquarters) and the various operating volunteer groups. Much could be—and certainly has been—written on how these local groups will work. "Blue" and "Red" warnings are flashed from the District Warning Center (under the Army Air Force) to the Control Center in "Ceedeeville, N. J." From the Control Center, heads of the various Emergency Services direct the operations of their trained volunteers in the indicated jobs; these jobs continue long after the air raid is over, continue, in fact, until near-normal conditions are reestablished. For those interested in the detailed functioning of any of the installations, agencies or volunteer groups, the OCD has prepared comprehensive instructional pamphlets with titles ranging from "U. S. Citizens' Defense Corps" to "The Messenger Manual."

Up to the present time the Army has had no direct relationship with these local corps except to give advice through the State Council on organization and training; regional office representatives have also inspected local units. In the event of emergency, a liaison officer from a near-by army post or unit would very probably be in the local Control Center and will be expected to be an expert in Civilian Defense. The Bomb Reconnaissance Units on the Staff of the Commander, Citizens' Defense Corps, are successors to the Bomb Squads, formerly under Emergency Police Service; the Bomb Squads (of trained police) could cope with stink bombs but knew little of the 2000-pounders. Now the Bomb Reconnaissance Units will verify the reports of unexploded bombs and report locations through channels; Ordnance Bomb Disposal Companies (under the Commanding

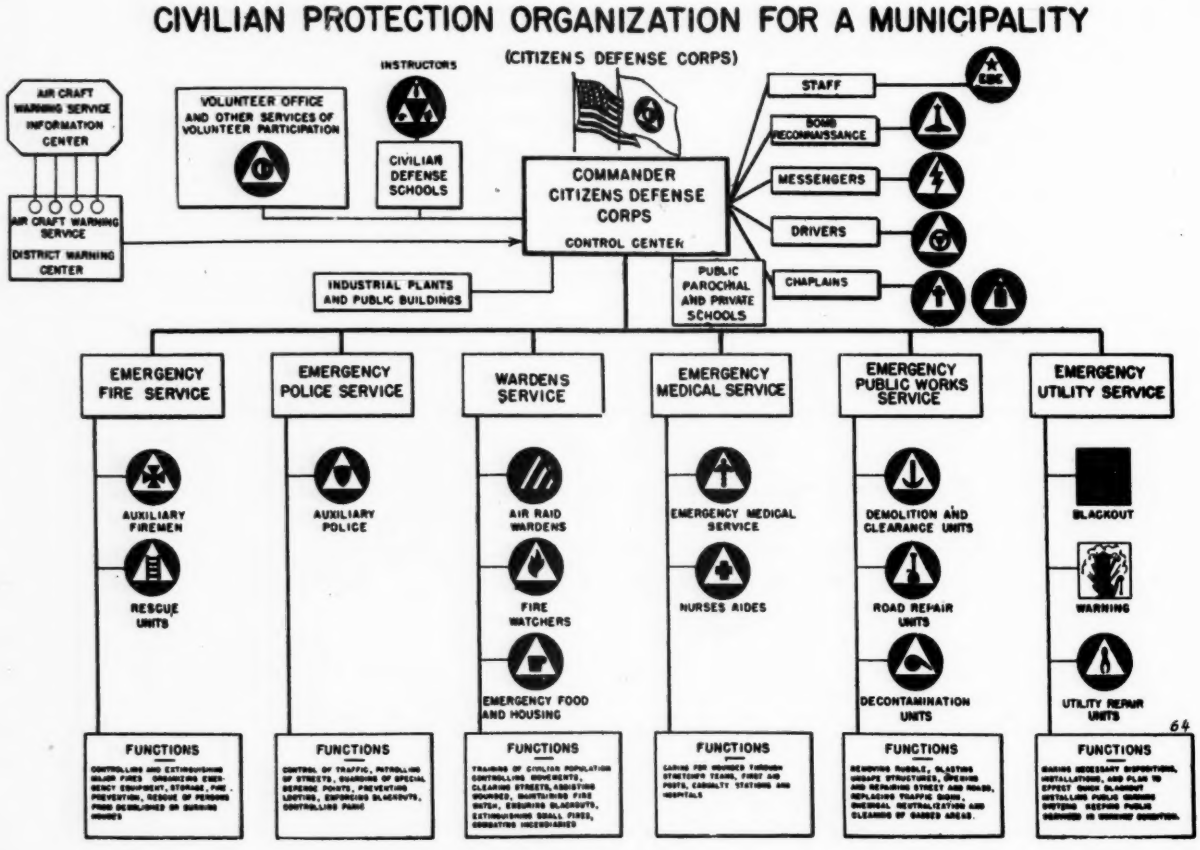

FIGURE 4.

General, Service or Defense Command) will do the removal job.

Up to this point, we have been primarily concerned with operations of Civilian Defense on the "Home Front," where the military *is cooperating* with all agencies of the civil government. The problems involved in military relations with civilians when rule under martial law has been invoked are somewhat different. Under these circumstances, the military authorities have the necessary power to force communities to act for their own protection. The existence of local Citizens' Defense Corps will relieve the military commander of that area or sector of the burden of details and necessitate only general supervision. These trained volunteer groups will be particularly helpful to the military if evacuation of civilian population becomes advisable. The authority and responsibility to order and control evacuation rests exclusively with the military commander—but well-considered plans, developed by the state and local Defense Councils and coordinated by the OCD Regional Offices with the Red Cross and all federal departments and agencies, after consultation with the military, can mean the difference between a well-ordered and successful movement and chaos. Plans for civilian evacuation already developed contemplate use of the Citizens' Defense Corps down to and including the Air Raid Wardens.

In summary, this article has emphasized:

(1) The responsibility of the military for active defense to include protection of vital installations in the Zone of the Interior—and the responsibility of civilians for passive defense—primarily protection of the civil population and property against the effect of air raids;

(2) The organization developed to accomplish passive defense, or civilian protection, and how it will operate during an emergency; and

(3) The important part the Army plays in the operation of the Civilian Defense organization.

In February 1942, at the time Mr. Landis became Director, several bills were introduced in Congress to turn the problem of Civilian Defense over to the Army—lock, stock and barrel. Fortunately, this idea never passed the discussion stage and it now appears that the present sound and vigorous organization of OCD, functioning smoothly and efficiently under civilian leadership, requires no such radical change in administration. However, necessary liaison between the Service Commands and OCD Regional Offices, operation of the Civil Air Patrol, cooperation with Bomb Disposal agencies and collaboration on Facility Security and Civilian Evacuation plans are sufficiently strong links in the relationship between the Army and the OCD to justify our sincere efforts to know and understand the Office of Civilian Defense—which in fact represents the organized efforts of the civilian population to assume their rightful share of the burden of Total Defense.

How often have we not heard the genius of Bonaparte slighted, and his victories talked of as destitute of merit, because at the point of the attack he was superior in number to his enemies! This very fact, which has so often been converted into a sort of reproach, constitutes his greatest and truest praise. He so directed his attack as at once to divide his enemy and to fall with the mass of his own forces upon a point where their division, or the distribution of their troops, left them unable to resist him. It is not in man to defeat armies by the breath of his mouth; nor is Bonaparte commissioned, like Gideon, to confound and destroy a fort with 300 men. He knew that everything depended ultimately upon physical superiority; his genius is shown in this, that although outnumbered on the whole, he was always superior to his enemies at the decisive point.

—Napier.

Antiaircraft Artillery with the Division

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MODERN COMBAT.—Modern combat has proven that, whenever an air threat is present, an infantry division in the combat zone must be protected by antiaircraft artillery. The German Stukas, the low level bombers, and the strafers despise no target however small. In North Africa single vehicles and small groups of personnel have, on numerous occasions, been attacked effectively by hostile aviation.

Since a division operating within range of hostile aviation is subject to air attacks, it should be provided with adequate protection against such attacks so that it can execute its assigned mission.

Automatic Weapons Battalion.—Attached antiaircraft artillery supplements passive measures of defense and fire from the organic weapons of small caliber. Because division troops and installations are not remunerative targets for attacks made at medium or high altitudes, the automatic weapons battalion, mobile, is a normal attachment.

This battalion contains 37- or 40-mm guns and .50 caliber antiaircraft machine guns. It is completely mobile, the 40-mm guns being towed by a prime mover and the .50 caliber AA machine guns being mounted in trucks. Normally one 37- or 40-mm gun and its companion .50 caliber machine gun are sited together and form one fire unit.

Intelligence Employment.—If employed in an intelligent manner by the division commander, the AA automatic weapons battalion will provide him with that vital protection necessary to combat dive bombing, low level, and strafing attacks up to ranges of 1500 yards. In active theaters, it has been proven that these weapons will reduce casualties in men and vehicles from air attack and will, through their destructive fire power, act as a deterrent against future attacks.

Antitank Mission.—AA weapons are expensive, special-purpose weapons designed to counter the air threat. While they possess many of the desirable features of a good antitank weapon (high muzzle velocity and rapidity of fire), they have many undesirable features (high silhouette, towed mount, and no shields). For this reason, AA artillery should always be assigned a primary mission of air defense and a secondary mission of antitank defense. In practice this secondary mission is performed, where possible, by siting the weapons so that either hostile air or ground targets can be engaged. When this is not practicable, the weapons should be sited to perform their primary mission of air defense.

In the absence of an air threat, the AA artillery should be assigned other missions such as antitank defense, accompanying infantry for the reduction of small field fortifications, and firing against small naval craft.

Purpose.—The purpose here is to indicate certain principles that division and combat team commanders should observe when employing antiaircraft automatic weapons units in a tactical situation; to present a tactical situation involving an infantry division with an attached AA automatic weapons battalion, mobile, in the advance and in the defense; to apply the principles governing the tactical employment of AA artillery in a practical manner; and to illustrate the orders issued to the AA battalion by the division.

PRINCIPLES

These principles are few and exceedingly simple:

1. The battalion should be employed under division control whenever practicable.

2. It should be used to furnish protection from air attack to those elements vital to the execution of the mission. This is determined by setting up a relative order of priority of objectives to be defended, and then furnishing adequate protection to the objectives in that order.

3. AA units should be in position prior to enemy air attack for most effective results.

4. When secrecy is desirable, fire should be ordered withheld except in the event of an actual air attack.

5. Assignment of primary missions to the AA battalion to provide protection against ground or seaborne attacks should be made *only after careful consideration.*

Situation.—Enemy located as shown on Situation Map A. Combat aviation is active on both sides. Air advantage is being disputed.

The 1st Infantry Division, with the 902d TD Battalion and the 901st AA Automatic Weapons Battalion, Mobile, attached, has been given the mission of protecting the debouchment of the remainder of the I Corps through passes A and B on 26 May.

At 0100 May 22, the 1st Infantry Division reinforced is in bivouac at C having completed a march stage. Routes to the southeast, assembly areas, and defensive positions have been reconnoitered. The defile (pass through the mountain) restricts movement throughout its length.

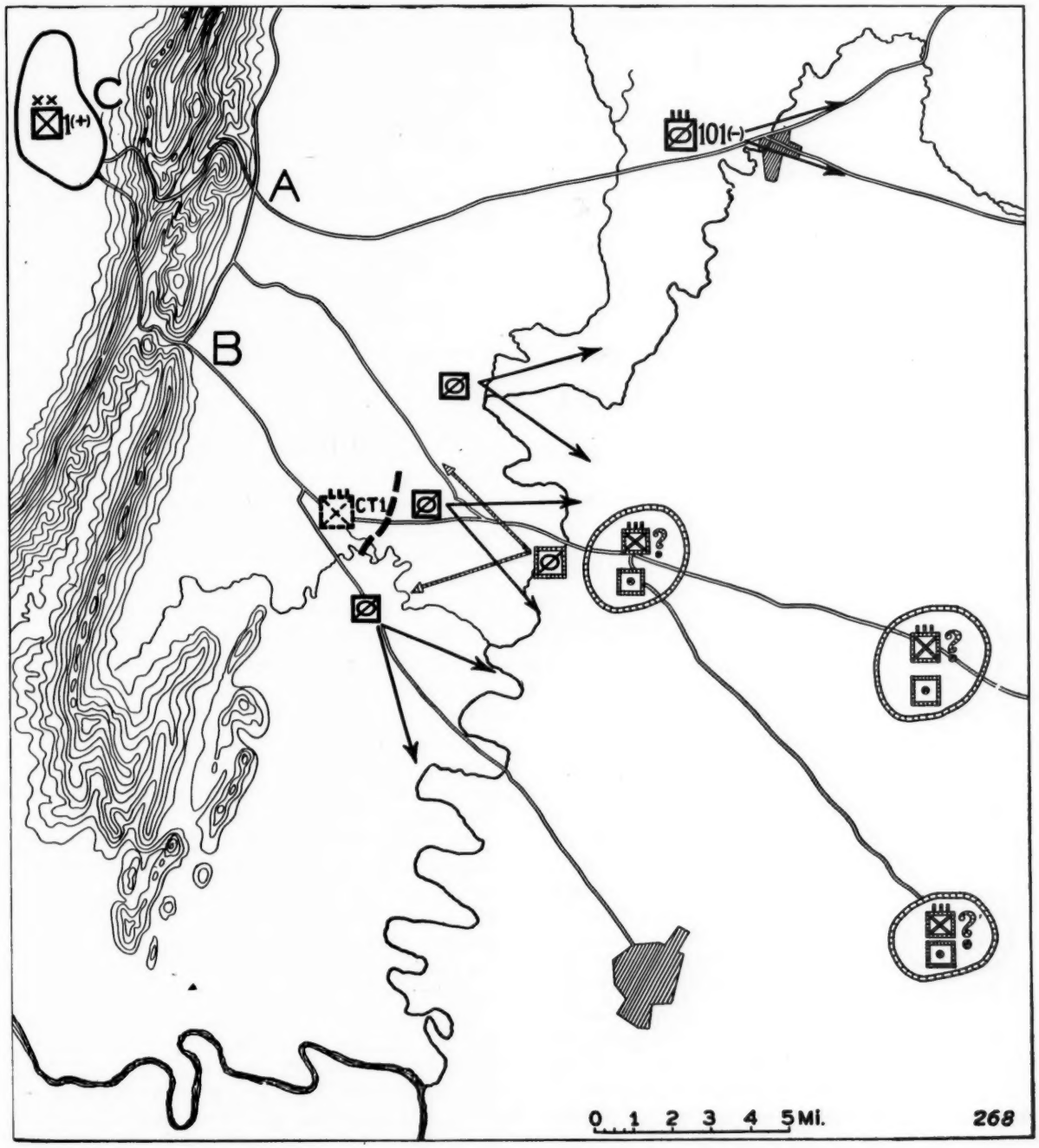
The division commander has made a decision to move CT-1 at 0300 by motor to a defensive position

as shown on Situation Map A in order to protect the passage of the remainder of the division through the defile. The value of time being of the utmost importance, movement of the balance of the division will commence at 0600. Daylight is at 0500. Weather is clear, night is dark.

Requirement.—The orders issued by the 1st Infantry Division pertaining to the employment of the 901st AA Auto Wpns Bn for the march.

Discussion.—Before the necessary orders can be issued, an estimate of the situation from the point of view of AA artillery protection must be made, culminating in a decision as to the relative order of importance of the elements to be furnished protection. The orders are then prepared to accomplish this protection in the most effective manner. Dependent upon the internal workings of the particular division, this estimate may be made by the division commander, the chief of staff, or G-3; or it may be made by the AA battalion commander and presented to any of the three individuals mentioned above.

Time Period Covered.—All estimates must cover a definite period to be effective. In our situation the first problem confronting the Commanding General, 1st Infantry Division, is getting his command through the defile where it is most vulnerable to at-



SITUATION MAP A.

tack both from the ground and from the air. Safely through the defile, he will plan his next operation based in large measure on the enemy situation at that time. The AA estimate, therefore, should be restricted to this time period, orders for the next phase being issued in due course.

Estimate.—As to combat strength, our forces and the hostile forces are equal. The distance to the proposed position for CT-1 and for the opposing forces is just about the same. To accomplish our mission, therefore, we must get the bulk of our forces on the position without delay and without undue losses. Air attack is probable and will adversely affect this mission. The next point to consider is where our own forces will be most vulnerable to attack: in the old bivouac area, in the mountain pass, in the open terrain to the east of the pass, in other defiles, or in the detrucking areas. The answer is apparent: in the mountain pass where movement and dispersion is restricted and where a few disabled vehicles will cause traffic jams with consequent delay not to mention personnel losses.

Priority.—Our first priority, therefore, should be to provide adequate AA protection for the bulk of the division in its march through the mountain pass.

Consideration of Means.—Applying our principle that AA units should be in position prior to an air attack, let us first determine how much AA artillery is necessary to provide adequate AA protection to the troops while in the defile, and second, whether it is practicable in this situation to emplace the weapons prior to the time the division moves through the pass. The pass is 1200 yards in length. As a rough approximation, let us consider placing our weapons on both sides of the pass, 1000 yards apart, pushing them out from the pass wherever practicable to distances of 300 to 900 yards. Sited in this manner, 24 fire units are necessary to attain protection from dive bombing and low level attacks delivered at altitudes up to 500 feet. As for getting the weapons into position, the AA artillery should not be sent out prior to 0300, the hour CT-1 begins its movement, because the mechanized cavalry to our front does not provide sufficient security for the protection of the AA artillery against ground attack. CT-1 does not require AA protection in the pass as it will move under cover of darkness. The night being dark, the danger of low level or strafing attacks in mountainous terrain is slight. Then, too, automatic weapons, when employed without searchlights, are relatively ineffective against air targets on dark nights. It is practicable, however, to move the 901st AA Bn (less 1 btry) forward immediately after CT-1. This method will permit the AA units to move under cover of darkness and will provide sufficient time to emplace the weapons in suitable positions prior to the time the bulk of the division begins its daylight movement.

Control of 901st Bn AA (-).—Since the 901st AA Bn (less 1 btry) will move in the interval between CT-1 and the remainder of the division, it should move under division control.

Covering Force.—After adequate protection has been provided under the first priority, one AA battery still remains unallotted. This should be used to furnish AA protection for the element next in importance to the execution of the mission. In this situation it is believed that the element having next priority is CT-1. This unit has the important mission of covering the remainder of the division as it emerges from the mountain pass. The enemy ground forces are sufficiently close that combat may occur prior to the time the remainder of the division can negotiate its passage through the defile. Hostile combat aviation can be expected to support the ground action. Computation of time and space indicates that CT-1 will be engaged in detrucking operations at daylight and will thus be vulnerable to air attack at that time. Additional AA artillery protection should be furnished this unit.

Control of Btry A, 901st AA Bn.—Since Battery A is to be detached from the remainder of the battalion and is to provide AA protection for CT-1, it should move with CT-1, and, for purposes of coordination during the march, it should be attached thereto. This point of control is important. If the commander of CT-1 is to be held responsible for the movement of CT-1, he should exercise control of all units moving in his column by command rather than by coordination.

Employment with CT-1.—Because CT-1 will move under cover of darkness, coupled with the fact that one battery cannot provide adequate protection for the defile, Battery A, 901st AA Battalion, should move near the head of the main body of CT-1 and go into position early to protect the detrucking area. When this mission is completed, the commanding officer of CT-1 should assign it another mission dependent upon the situation that exists at the time.

Staff Duties of AA Officer.—The commanding officer of the AA battalion attached to a division is available to assist the commander and staff officers of the division in the tactical employment of the AA battalion. For best results, his recommendations should be considered. However, dependent on circumstances and personalities, his recommendations may or may not be called for or accepted. The force commander alone is responsible for the actions of his division and he will employ the attached AA as he sees fit. If he does not employ the AA intelligently, his unit will suffer. This same principle applies to the relationship between the commanders of CT-1 and Btry A.

Solution.—After making an estimate similar to the one outlined above, the commanding officer of the 901st AA Bn submitted the above plan to the chief of staff. The chief of staff directed the Division G-3 to translate this plan into orders which he did as follows:

"The 901st AA Auto Wpns Bn less Btry A follow CT-1 provide protection remainder Div through defile. Btry A attached CT-1 at once."

Summation.—Please note that in the solution to this problem the following principles were observed:

1. A relative order of priority of objectives to be defended in this particular situation was set up.

2. Adequate AA protection was then furnished to objectives according to this priority.

3. AA units were in position prior to the time air attack could cause the most damage.

4. The AA battalion was kept under centralized control except when such control was not practicable.

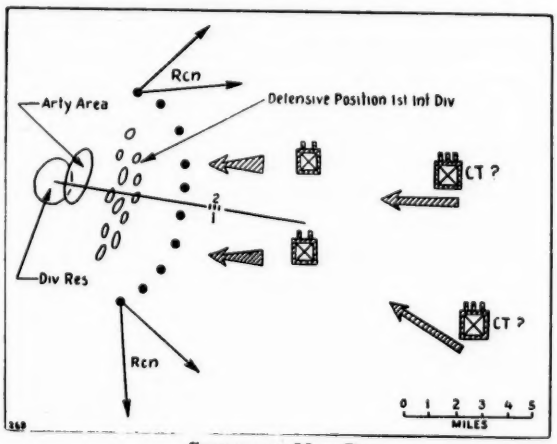
AA Artillery in the Defense.—Having provided protection for the 1st Infantry Division during the advance, let us project the time forward to 1000, consider the situation confronting the division commander at that time, and discuss the employment of the AA automatic weapons battalion to meet the new situation.

Enemy.—Hostile forces, estimated to be a regimental combat team, are attacking our cavalry as shown on Situation Map B. Two other hostile columns, estimated as combat teams, are moving forward as shown. No enemy forces other than small cavalry patrols have been reported close in on either flank. Hostile combat aviation delivered two strafing attacks on our columns in the pass but were driven off by AA fire after inflicting slight damage and causing minor delays.

Own Troops.—CT-1 is in position as shown on Situation Map A. CT-2 as cleared the pass. CT-3 will clear the pass at about 1100. The division troops are following CT-3.

Army plans to establish Class I, III, and V truckheads in area by 0100.

Corps will take over AA protection of the passes arriving at McConnellsburg at 0200 but will not provide AA protection for the truckheads.



SITUATION MAP B.

Decision.—The division commander has decided to defend the position shown on Situation Map B, dispositions as indicated, without delay.

Requirement.—The orders issued to the 901st Automatic Weapons Battalion, Mobile, for the defense.

Estimate.—Once again an estimate of the situation must be made in order to establish a priority of elements or installations to be defended before the necessary orders can be issued. Objectives to be considered are:

1. Troops on the forward portion of the battle position.

2. Division reserves and their routes forward.

3. Division artillery.

4. Supply establishments.

5. Division command post.

All of these elements and installations are vital to the defense and should receive some protection. A coordinated AA defense, protecting all of them, would be the ideal solution. This is rarely possible, so let us set up a relative order of priority and then coordinate the fires of our weapons to the greatest extent practicable.

Reserves must have first priority as the counterattack is the vital element in our doctrine of the defense, and the reserves launch that attack.

Between the infantry in the most advanced defensive localities and the artillery, there is little choice as to which is the more important. The infantry troops gain some protection by dispersion and the use of trenches. Artillery is better supplied with organic machine guns but is more subject to air attack. Second priority is assigned to the infantry for the following reasons: Automatic weapons should be sited not closer than 800 yards to the forward edge of the battle position. When so sited they will be able to engage hostile low-flying aviation coming in from the direction of the enemy and thus furnish a certain amount of identical protection to the artillery. Likewise, when sited to protect elements on the forward portion of the battle position, certain weapons will be in position to provide AA protection for the reserves in their movement forward to positions from which to launch the counterattack.

Third priority goes to the artillery.

Supply installations for a division are small and must rely upon dispersion and train defense weapons for antiaircraft protection. Operation of supply points should be under cover of darkness. Since the night is dark, if counterintelligence discipline within the unit is good, the chances of successful low level attacks are remote. Similarly a division command post is small and should be dispersed. It is normally sited well forward so that it will receive incidental protection from weapons providing defense primarily for other elements.

Control of AA Artillery Battalion.—Since the 1st Division will be fighting as a unit under division control; since the AA artillery will be sited throughout

the division area; and since the AA defense should be coordinated to the fullest extent, control of the AA artillery should be exercised by the division through the commanding officer of the 901st AA Battalion.

Other Considerations.—Army will take over protection of the mountain pass by 0200. Our division troops will clear the pass by 0100. The question arises as to when to move the 901st AA Battalion (less 1 battery) from position. For purposes of coordination, our battalion should move out prior to arrival of the corps AA artillery in order to prevent confusion.

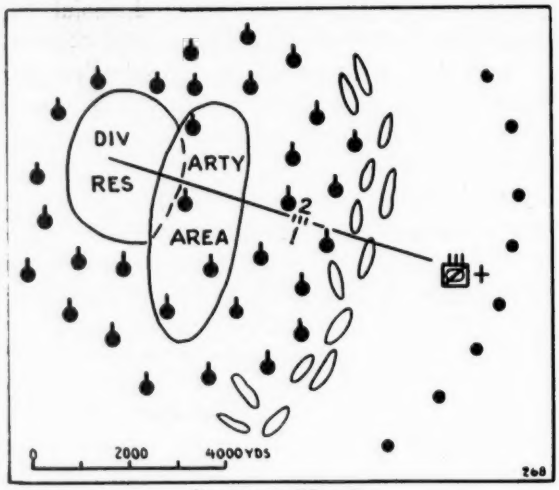
In a defense, attack by armored vehicles is a particularly dangerous threat. However, it must be remembered that weapons other than the AA artillery are available in the division for antitank defense as a primary mission, to wit: the infantry 37-mm antitank guns, the attached tank destroyer battalion, and the "bazookas."

As to the time AA units should be in position, here again it is desirable to have the AA units in position as early as possible—hence, they should be given priority on roads.

Solution.—Fragmentary orders written on an operations map (Situation Map B) received by the CO 901st AA Battalion at 1030:

"Move 0100 to provide AA protection following priority: Div Res, front lines, arty. Secondary Atk mission. Btry A reverts at D 0100. Priority on roads 901st AA Bn 0100—0200."

Execution.—The AA battalion commander sited his weapons as shown on Situation Map C in compliance with the above order.



SITUATION MAP C.

Summation.—Application of the principles listed below will pay dividends:

1. Employ the AA artillery under centralized control whenever possible.

2. Establish a relative order of priority of elements or installations to be protected, and provide AA protection for them in that order.

3. Arrange to have the AA artillery in position prior to the time the protection is needed.

4. Assign the mission of antitank defense to AA artillery units only after careful consideration.

In a dictatorship morale is a tender plant. All the time it seems to need artificial heat; and for all its brave show it may well wither and die as rapidly as it blooms. In a democracy, morale is a less impressive plant. It may seem to grow slowly and may not be very responsive to the efforts of the gardeners. But it is hardy; and neither the summer sun nor the frosts of fall will kill it.

—Lord Halifax, British Ambassador to the United States, before the Foreign Policy Association.

The Supply of a Mobile Division in Open Country

COLONEL J. G. COWLEY, *Royal Engineers*
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The differences between the British system described below and the standard U.S. set-up for an armored or motor division are not so great as might appear at first sight. The main difference is that in the British system the standard practice is for division to have complete control of the 2nd line transport, thus corps (or army) only assumes responsibility up to and including the F.M.C. This means that the divisional or 'mobile' area is of a depth of some 50 miles. In the U.S. system the equivalent of the 2nd line link is under control of the higher formation, corps or army. The division takes over from the equivalent of the 'replenishment areas,' some 25 to 35 miles back, to which army is responsible for sending up supplies as requested by the division. Distances are altered to meet conditions of combat.

The point of difference is the handing over of this extra link in the chain of supply to the division. The advantage of the British system is extra mobility and radius of operation within the division; the advantage of the U.S. system is more divisional freedom and economical use of transport.—THE EDITOR.

GENERAL PERSHING, late in his career, wrote: "In each succeeding war there is a tendency to proclaim as new the principles on which it is conducted . . . but the principles of war as I learned them at West Point remain unchanged. . . ."

The development of modern war is characterized by the word "speed." The fixed lines of defense which in past wars separated one side from the other are being replaced by battle zones in which mobile armored forces maneuver over many square miles of ground, each side trying to outflank and threaten the line of supply of the other. The German drives through Poland, France, Western Russia, and more recently in North Africa, are supreme examples of this speed, and any army which expects to combat the German Army of today must be prepared to face these tactics, and to counter them by improving on the German methods.

Despite this increase of mobility, the saying that an army marches on its stomach is as true today as it has always been, even if the stomach now requires millions of gallons of gasoline and hundreds of truckloads of ammunition to feed it. An army is dependent on its supplies, and the speed and power of maneuver of an army is only as great as the mobility of its supply organization. Any force, however mobile its fighting vehicles, has its radius of action limited to a few miles if it is tied to fixed supply installations.

The British Army in Egypt, has, for the last three years, been trying to work out a system of supply sufficiently elastic to compete with the speed of mobile forces operating in open country. It has found that such a system must be based on three fundamental conditions:

1. Radio communication throughout the supply system.

2. No fixed installations or dumps near the fighting zone.

3. A truck rather than a rail basis.

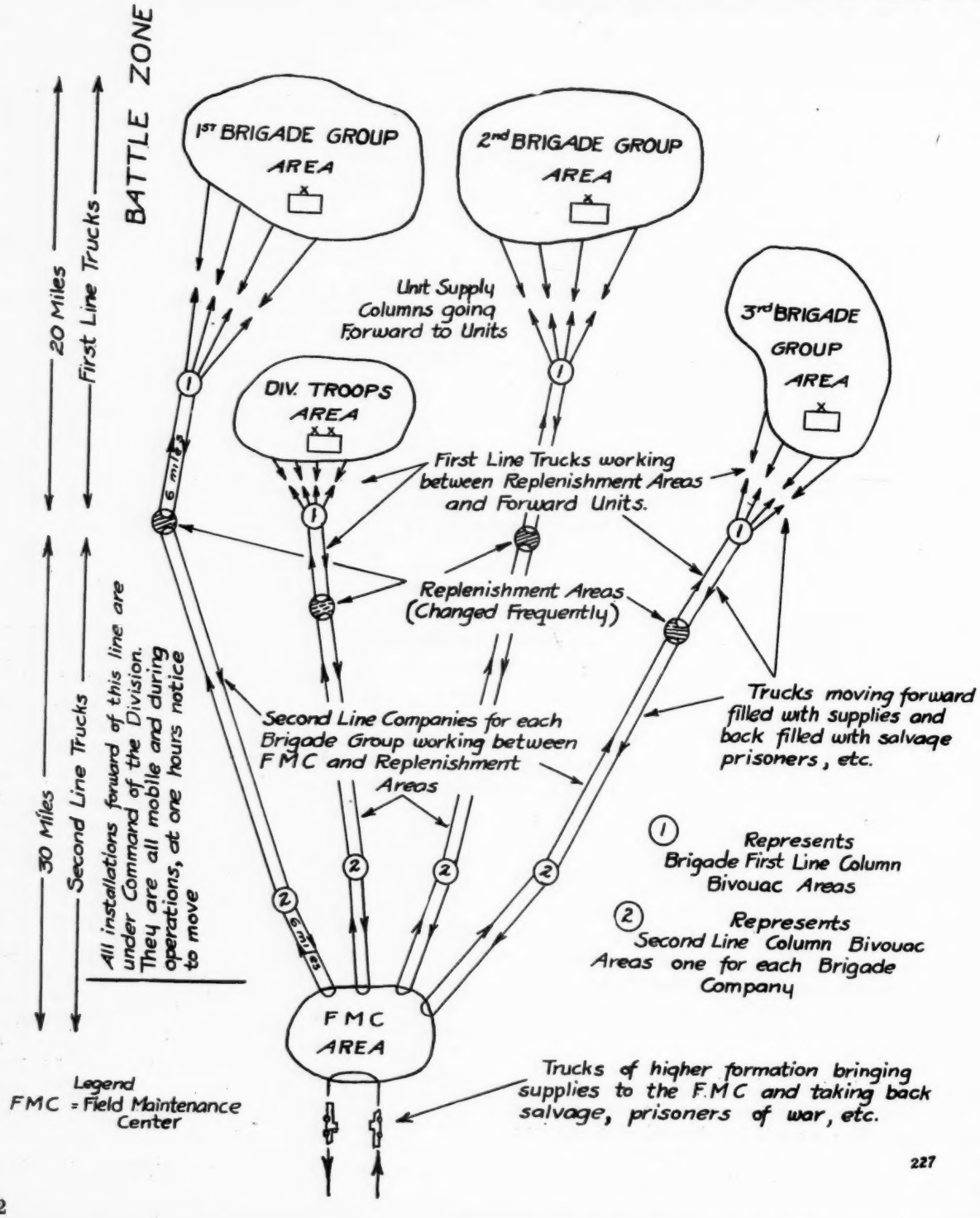
It is not necessary to dwell on the need for radio communication. Telephone lines take time to lay, and time to pick up again. In a fast-moving battle there is seldom time to lay line, which once laid, is more frequently than not left behind on the ground. This applies, more obviously, to the withdrawal, but it was found in the last advance through Libya and Tripolitania that telephone communication within the armored or motorized division was not normally possible.

The principle that no fixed installations should be near the fighting zone is a fundamental feature of mobile supply. The distance which should be clear behind the forward troops varies with the type of country. In open desert it was found that 50 miles was a fair average. This would be reduced in more close terrain. The basic fact is that a rapid enemy thrust must not be allowed to overrun supply installations. All hospitals, work shops, and supply centers within the area behind the fighting zone must be sufficiently mobile to get out of the way of a thrust by an armored enemy column. It has been proved that it is not possible to prevent these thrusts penetrating to a considerable depth. If they are allowed to capture important centers of supply they achieve their object, which is to disorganize the force opposed to them. A force cannot continue to fight once its supply has broken down. A steady stream of gasoline, ammunition and rations is essential to keep the combat troops in action; once this stops, even the bravest men and the best machines soon cease to have any fighting value.

The need for mobility of supply leads directly to

the third principle, reliance on trucks rather than on railways, except in the rear areas. A railway system is of necessity static. A railhead cannot be moved in a hurry. Railway lines cannot be built forward quickly enough to compete with the rapid advance, and they will not be handed over intact by the retreating enemy. Railway trains cannot be switched quickly from place to place; they must run to a fixed time table. All of these disadvantages are overcome by the use of truck columns in open country, where their movement is not confined entirely to roads. The distance of the railhead behind the forward zone is again determined by the depth to which enemy columns can penetrate. In mobile warfare in open country it might be dangerous to have the railhead less than 70 to 80 miles away from the fighting zone.

Given these three basic conditions, the problem is to work out a supply system for a mobile division which conforms with them. The solution which is described below has been reached mainly as a re-


BATTLE ZONE
20 Miles
First Line Trucks
30 Miles
Second Line Trucks
All installations forward of this line are under Command of the Division. They are all mobile and during operations, at one hours notice to move
1ST BRIGADE GROUP AREA
2nd BRIGADE GROUP AREA
3rd BRIGADE GROUP AREA
DIV. TROOPS AREA
Unit Supply Columns going Forward to Units
First Line Trucks working between Replenishment Areas and Forward Units.
Replenishment Areas (Changed Frequently)
Second Line Companies for each Brigade Group working between F M C and Replenishment Areas
Trucks moving forward filled with supplies and back filled with salvage prisoners, etc.
6 miles
6 miles
1 Represents Brigade First Line Column Bivouac Areas
2 Represents Second Line Column Bivouac Areas one for each Brigade Company
F M C AREA
Trucks of higher formation bringing supplies to the F.M.C and taking back salvage, prisoners of war, etc.
Legend
FMC = Field Maintenance Center

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sult of the battle experience of the British 7th Armored Division, which formation has seen more service than any other British formation during the present war. This system was not developed suddenly. It was evolved, and is still evolving. In its present state it has been adopted by all the armored divisions in the British Eighth Army, and it is fair to say that a considerable part of the recent success of General Montgomery's forces has been due to the soundness of their supply organization. It is not suggested that this system is the only answer, or the best answer, that can be found to the problem of supply of mobile forces. It is given as a solution to the problem, a solution that has been found to work in combat, and therefore a system that is worth study.

Each mobile or armored division is based on a Field Maintenance Center (FMC) which is an area in which two days' supply of gasoline, ammunition, rations and water is held for the division. These commodities are stacked on the ground in well dispersed dumps, all the gasoline in one area, ammunition in another, rations and water in a third. In addition, a small Divisional Reinforcement Camp, a Divisional Salvage Dump and a Divisional Prisoner of War Cage are located in the FMC area, which covers several square miles. There is normally one FMC for each division, and the number of days supply held in it is decided by the higher formation and not by the division. Usually the FMC contains two days' supply of each commodity for the division, and the job of keeping the stores in the FMC up to the correct figure is entirely the responsibility of the higher formation.

In desert country the FMC for an armored or motorized formation is normally about 50 to 70 miles from the fighting zone. This distance is variable and depends largely on the speed at which truck columns can travel between the FMC and the forward areas. In more close country this distance would be reduced.

All installations forward of the FMC are mobile, and, during periods of battle, at the maximum of one hour's notice. Divisional hospitals or work shops which require longer than this to move are kept back level with the FMC area. The FMC and all division installations are in radio communication with Division Headquarters, which is normally some 10 to 12 miles behind the fighting zone.

The supply system forward from the FMC to the fighting troops is shown in the diagram. It is based on two echelons of trucks for each Brigade Group.* The rear echelon, known as the second line, works between the FMC and the Brigade Group replenishment area some 30 to 40 miles ahead. The forward echelon, known as the first line, works between the replenishment area and the forward troops. There is a separate replenishment area for each Brigade Group and for Divisional Troops. The second line consists of trucks of the Service Corps driven by service drivers, but permanently allotted to the Brigade Group for which they work. The first line consists of trucks belonging to the combat units comprising the Brigade Group, driven by unit drivers, but collected, for ease of control, under the command of one officer for each Brigade Group.

Each echelon has sufficient trucks to carry 100 miles of gasoline, one day's battle expenditure of ammunition, and one day's water and rations for the formation which it serves. This means that, apart from the quantities of gasoline, ammunition, water and rations actually held with the fighting troops and in the fighting vehicles, there are, forward of the FMC, 200 miles of gasoline and two days' supplies. These two echelons each make one round trip in 24 hours. Every day one day's supply of commodities leaves the FMC in second line trucks, is handed over to the first line trucks in the replenishment areas, and is carried in first line trucks to the fighting troops.

The second line trucks of the division are divided into companies, one company for each Brigade Group. The commander of each second line company is in constant radio communication with Division Headquarters. The commander of the first line trucks of each Brigade Group is a major, the Brigade Group Supply Officer, who is in constant radio touch with his Brigade Group Headquarters. Each unit first line trucks is under command of the Unit Supply Officer, who works under the Brigade Group Supply Officer. These Unit Supply Officers are in canstant radio touch with their own Unit Headquarters.

The daily routine of each of the second line truck companies is as follows. They refill from the FMC in the afternoon with one day's supply of gasoline, ammunition, rations and water for the Brigade Group which they serve. After refilling, they drive to the company bivouac area within 5 or 6 miles of the FMC area. During the late afternoon and evening the truck drivers maintain their trucks and sort out the rations from commodity loads into battalion loads. Early the next morning the company goes forward some 30 miles to the replenishment area where it hands over its loads to the first line trucks of the Brigade Group. This operation of replenishment takes not more than 40 minutes with trained men and should be completed before midday, after which the second line trucks return to the FMC filled with returning empty gasoline and water containers, salvage, prisoners of war, and leave personnel which have been handed over to them by the first line trucks at replenishment area. These they dump in the FMC area, where they refill with supplies for the following day.

The first line trucks, after replenishment, drive

*Combat Command.

forward to the Brigade Group first line bivouac area some 15 miles behind the fighting zone where, if necessary, they further break down and reload the rations into company or battery loads. Late in the afternoon the unit columns go forward independently from this area to their units, to whom they deliver one day's supply at dusk or during the night, depending on the tactical situation. After handing over their supplies to the fighting troops these unit supply columns return at night or early the following morning to the Brigade Group first line bivouac area. The Brigade Group Supply Officer waits till all the unit columns have returned when he sets off again with the complete Brigade Group first line to the replenishment area. Here he hands over to the second line all prisoners and salvage, moving back from the battlefield. The first line trucks load with the next day's supply, and so the cycle is repeated.

At replenishment, the Unit Supply Officers hand over to the second line company commander a copy of their ration strengths and estimated requirements of gasoline and ammunition for the following day. These act as a guide for the second line when refilling at the FMC.

A feature about the system is that all supply columns are at all times in radio touch with some operational headquarters. The second line is in contact with Divisional Headquarters. The first line when collected up is in contact with Brigade Group Headquarters, and the unit supply columns when they separate out to go to their respective units are in touch with their Unit Headquarters. This means that at any time any column can be stopped or switched in any direction according to the immediate tactical situation. The necessity for this has been brought home again and again during the fighting in North Africa. Truck columns out of touch eventually find their way into enemy hands. During the past two years the Germans have captured many hundreds of British trucks. At one time a large proportion of the supply vehicles in the German Afrika Korps were British. This was mainly due to independent columns of trucks travelling up in the forward areas, out of touch with any operational headquarters, without any means of knowing the rapidly changing tactical situation, looking for units that had already moved, and eventually running into enemy armored columns. It has happened again and again and will continue to happen unless constant control of all truck columns is insisted on.

Another feature of this system is its flexibility. Replenishment areas for Brigade Groups can be changed daily to suit operational requirements. Normally they are decided on the previous evening, sometimes in a fast moving battle they cannot be fixed until the actual morning of replenishment. Once the Divisional G-4 Staff Officer has decided on the areas and times for replenishment, the second line company commanders are told by radio from the Division Headquarters, who also tell the Brigade Group Headquarters, who in turn pass the message to the commanders of their first line columns. Five minutes after replenishment areas and times have been decided on, information should be in the hands of all the necessary officers. A simple radio code, changed every day, is used, which with practice takes little longer to send and receive than speech in clear.

This leads to the final point which this article is intended to emphasize, the need for all officers who serve with mobile formations to be highly trained in talking on the radio. Radio talking is not like telephone talking. It requires hours of practice to become quick and efficient. One slip may endanger many lives, as all conversations can be overheard by enemy listening sets. This fact makes many officers scared to talk, and it is only by training that this feeling of nervousness can be overcome. With constant practice, however, radio talk becomes almost as quick as telephone talk, and its advantages, especially in mobile operations, cannot be overstressed.

The British system has been explained in a certain amount of detail. It is only a step in the evolution of a supply system to fit the needs of modern mobile warfare, and it is by no means perfect. It fails to solve the difficult problem of how to prevent waste of transport when dealing with intermittent demands such as gasoline and ammunition, where the number of trucks necessary for a day of heavy expenditure is far too great for a day of little fighting or movement. The system described involves a large number of trucks, of which a large proportion stand idle except in periods of sustained battle. It has, however, the advantage of extreme mobility, and it is given in the hope that it will stimulate thought and discussion, as it is by intelligent thinking, based on experience, and not by acceptance of stereotyped systems, that the art of warfare is developed.

An order shall contain everything that a commander cannot do by himself, but nothing else.

—Field Marshal von Moltke.

Exploitation of Local Resources

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PARAGRAPH 62 of Field Manual 100-10 reads as follows: "Supplies are obtained in the theater of operations by prearranged schedules of shipments from, or by requisitions on, the zone of the interior, or by exploitation of local resources, including captured material and salvage of equipment partly worn out or abandoned. Local resources are utilized to the utmost especially supplies such as food, forage, fuel, and engineer construction materials."

Let us take one phase of this as our text for this discussion, "Local resources are utilized to the utmost."

This is not a new idea. Sun Tzu wrote "The Art of War" about 500 B. C. It is probably the oldest military treatise in the world. The following is a quotation from a translation.

"Hence a wise general makes a point of foraging on the enemy. One cart load of the enemy's provisions is equivalent to twenty of one's own." Later he says, "Make forays in fertile country in order to supply your army with food."

The importance of the utilization of local resources varies somewhat with the location of the theater of operations. The farther away the theater is from the zone of the interior, the more important it becomes, as the transportation difficulties become increasingly greater. In a war situation such as we are faced with today, the importance of utilizing local resources is paramount. Every ton that we can secure locally means one more ton of previous shipping space for essential material that cannot be obtained overseas.

The types of resources that particularly lend themselves to utilization are: shelter, utilities, transportation, communications, services, and supplies.

These resources may be exploited by purchase, requisition, contributions, billeting, or confiscation.

Purchase is in general the most advisable manner of obtaining supplies. Purchase at the market price, or in some cases even higher if necessary, is desirable on the theory that this is probably cheaper than purchase plus transportation from the zone of the interior. This also has the advantage of improving relations with the local people. Purchase is practically always used when in our own, or friendly, territory.

Purchase is the ideal system, even in enemy territory. Some may take exception to this, feeling that the conqueror is entitled to supplies at his own price. But the offer of remunerative prices appeals to the greed of the people, and they will bring out reserves that may have been in hiding. Generally, the poorer classes of citizens remain in an invaded country, and paying them in ready cash for supplies taken from them, results in a much more contented populace. With money available, they will return more readily to their normal way of living, and the problems of military government will be greatly reduced. An invading army should provide itself with enough money which is current in the invaded country, to cover the supplies that may be purchased.

Of course when purchase does not produce the desired results, requisition can be employed. Requisitions are demands made on the inhabitants, which differ from purchases, in that the buyer fixes the price and the owner has no choice. It should be used only when the method of purchase has not produced the desired result. The requisition should be presented to a recognized civil official and only in exceptional circumstances should it be presented to an individual. Under the Hague Conventions of 1907 requisition can only be employed under the authority of the local commander.

A requisition is an order for the delivery of certain quantities of supplies, to a certain point, at a certain time, for which a certain payment will be made. A fair price should be paid, and if possible, the payment should be made in cash at the time of delivery, although if this is inconvenient, a receipt may be given for later redemption.

Contributions involve the taking of money from the population in excess of taxes. Under the Hague Conventions these shall be collected only on the written order of a Commander-in-Chief, and shall as far as possible, be in accordance with the assessment of taxes in force. For every contribution a receipt shall be given to the contributors.

Confiscation may be resorted to when all other methods of obtaining required supplies fail. This however, should only be used as an extreme measure, as it creates a very hostile attitude in the inhabitants, and frequently results in the hiding of large quantities of supplies. An 1814 decision of the United States Supreme Court has the following to say on this subject:

"That war gives to the sovereign full right to take the persons and confiscate the property of the enemy wherever found, is conceded. The mitigation of this rigid rule, which the humane and wise policy of modern times has introduced into practice, will more or

less affect the exercise of this right, but cannot impair the right itself."

When, from lack of time or other reasons, requisitions are not available, supplies in kind may be taken directly by force from the fields or other places by foraging. This is usually only resorted to for the supply of small parties and advance troops.

There is some thought that troops engaged in raids and rapid movements should be permitted to forage freely. But this does not give satisfactory results. The troops will do it with the one thought uppermost in their minds, that it is their privilege to provide for their immediate needs to the maximum, and give little thought to the ultimate problems created. Marauding leads to concealment of supplies and total cessation of production. It is very difficult to prevent the troops from abusing and alienating the enemy population. Once foraging is permitted, it is difficult to prevent it on the next occasion. Absolute prohibition of such practice is about the only system to employ, except in dire emergency.

Billeting is the assignment of troops for shelter in private or public buildings. The advantage of billeting is that it provides immediately available shelter, and the troops are not readily observed from the air, since no new buildings have been erected. However, it tends to reduce the productive capacity of a region, as the protecting presence of the male is usually felt necessary in a home occupied by soldiers, and he is kept from working in the factory or in the field.

In the United States and in our possessions, billeting in private dwellings is limited by the Third Amendment to the Constitution, which reads:

"No soldier shall, in time of peace, be quartered in any house without the consent of the owner, nor in time of war, but in a manner to be prescribed by law."

In friendly territory the local laws and customs regarding billeting will be followed.

In hostile territory billeting is used when desirable, and is handled as a form of requisition.

History substantiates the wisdom of the practice of adopting a just policy toward the inhabitants of an enemy country. As far back as the 15th Century, King Henry V of England farbade injuries to property and insults to women. The justice of his military government, and the discipline of his troops contributed greatly to his success.

One of Frederick the Great's instructions to his Generals was that they must "prevent pillage, which is the source of the greatest disorders."

In our own history, General Winfield Scott's campaign in Mexico, from his landing at Vera Cruz in March 1847, to his capture of the City of Mexico the following September, is one of the best examples of almost entirely supplying an army in enemy country, and at the same time maintaining the friendship of the inhabitants. A deputation of Mexicans offered General Scott the dictatorship of their country after the fighting was over.*

In the Civil War, the Federal government made an error by deciding the policy of payment upon grounds of loyalty. Receipts for supplies were given, but they were only paid when the holder could prove loyalty. This amounted to confiscation of enemy property. It resulted in concealment and destruction of property, and the production of the territory fell off to practically nothing.

Under the terms of the Armistice of November 11, 1918, Germany was required to pay and subsist the armies of occupation. This amounted, in effect, to the levying of a contribution upon the whole of Germany. Our commanders used the proceeds of this contribution to buy supplies from the German people in the occupied territory, resulting in much friendlier relations.

So far in the present war the obtaining of supplies locally for troops overseas has been tied up with the Lend-Lease program by what is known as "Reverse Lend-Lease."

As far as possible American troops on foreign soil are being fed, housed, and equipped out of United Nations supplies. These are furnished on the same basis as we supply Lend-Lease material, and this reciprocal aid rendered to us, is credited against the Lend-Lease articles and services furnished by us.

Under these reciprocal Lend-Lease arrangements, the services, supplies, equipment and facilities obtained by the American troops are inventoried, assessed as to value, and receipted for by the receiving American Unit. Agreement as to the estimated dollar value of the items, is settled with a responsible representative of the foreign government concerned.

The supplying foreign government then receives appropriate credit against its account on the Lend-Lease books in this country.

This program is designed to provide a more equitable distribution among the United Nations of sharing the cost of the war by utilization of a large scale barter system, and to obtain as many supplies on the scene as possible, thus saving valuable shipping space and time. The procedure by which negotiations are conducted directly with representatives of the foreign governments will avoid bookkeeping details, and delays which would occur if formal cash contracts had to be arranged with private firms or individuals for every item. The amount of such foreign assistance to our troops is determined solely by the individual country's supply ability.

In England we are obtaining all types of supplies from fan belts for trucks to squadrons of spitfires, materials and labor for construction, weapons and ammunition. It is estimated that last year over

*_Dictionary of American Biography._ J. H. Smith, _The War With Mexico,_ II:323.

200,000 tons of shipping a month was saved in transportation of supplies to England.

Australia and New Zealand furnish most of the food for our troops in the Southwest Pacific. Also Australia is furnishing much of our requirements in the line of woolen clothing.

What you may run into in some of the places now occupied by American soldiers comes from the following report from New Guinea:

"Food is passable; almost all of it comes from cans. There is no food obtainable in New Guinea beyond a few paw paws, bananas, and coconuts. Supply officers laugh grimly over the suggestion from headquarters that they supplement rations by buying in the open market.

"There are no civilians left in New Guinea. Papua's white population was never more than 2,000. Those who were not taken into the Australian Army, chiefly for such jobs as required dealing with natives, were evacuated six months ago and more. There are no women. Even native women have been sent back into the hills. Native men are brought in from their villages for two-month turns at simple, light labor. They wear dirty skirts called ramis, and spend their idle moments combing their hair with four-pronged metal forks."

Considerable study must be given to the problem of determining the availability of supplies. All available statistics on the region must be secured. The presence of cities and towns must be considered. These are a drain on the food resources of the surrounding country, but on the other hand they often contain large reserves of such supplies. In any estimate the needs of the inhabitants must be considered. Supply intelligence is very important to this study. No information is more valuable than information by districts regarding supplies and crops.

Repair of British Army Vehicles

[From the London *Times* 18 January 1943.]

Soon after the present war began the workshops of the various arms of the British Army were scattered under different controls, some under the Royal Engineers, some under the Royal Army Ordnance Corps, and some under the Royal Army Service Corps. Today all repairs to vehicles, tanks, guns, carriers, range and height finders, indeed everything from the smallest watch to the latest and heaviest tank, are done by the Royal Electrical and Mechanical Engineers, (R.E.M.E.), who control all workshops needed in the British Army. This new corps is still young, but it is already very large and is still growing.

Their workshops are divided into four echelons, one working at the front line; another just behind the line; a third some way behind the line; and the fourth probably at the base. The first two echelons are mobile, the third semi-static, and the fourth static. The light aid detachments (l.a.d's of the R.E.M.E.) in the battle of Egypt, which drove Rommel from Egypt and Cyrenaica, repaired and got back into action no fewer than 1,200 tanks in the first month of that battle. They had heavy casualties. Tanks, trucks, carriers, and other things they could not repair were sent back to the next workshops, and if the repairs were still too heavy they were sent back to the third echelon and some from there to the base. The l.a.d's have to fight as well as to salve and repair.

Each division of the British Army has 9 to 12 l.a.d's, and they are trained to clear mine fields, fight infantry actions, demolish military objectives, recover tanks, trucks and carriers—all under fire—from rivers, shell holes, or wherever they may have wandered. I have just seen a Churchill tank at the bottom of a deep pit with plenty of water at the bottom. It was easy to see how in the dark or mist it had nosed its way into it. It was difficult to see how it was going to be gotten out. The country consisted of that kind of clay which is most difficult to dig with a shovel. Yet an l.a.d. came along with a three-ton lorry, and, with the aid of steel ropes, pulleys and winch, and really hard and most ably directed work, got the Churchill out and on to a trailer and sent it off to the second echelon shops. The damage was too heavy for them to repair.

In the first three echelons the membership is entirely military but in the heavy base-shops a number of women are employed on light repetition work and secretarial work. A large percentage of the military craftsmen are army trained. These l.a.d's are attached to tank, artillery, and reconnaissance regiments and to infantry brigades. Every member of an l.a.d. must be a skilled craftsman, artificer, fitter, welder, or electrician. He must also be a fighting soldier.

Medical Problems in Jungle Warfare

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IN JUNGLE warfare the soldier fights two enemies: Man and Nature, and of the two Nature is often the more formidable. Where are American troops carrying on active operations today? In the Solomon Islands and in New Guinea, both areas located in the tropics where jungle and mountain conditions prevail. Other potential theaters worthy of mention are Java, Burma, Mindanao, and the Bataan Peninsula —all tropical and mountainous. It would appear that the matter of jungle warfare is becoming increasingly important day by day, and should deserve careful consideration.

There are certain sanitary, medical, and evacuation problems of great importance to all commanders and staff officers who will fight the enemy under conditions of jungle terrain, climate, etc. These problems are referred to at length in Field Manual 31-20, which has been extracted and condensed to cover the following:

HIGH PHYSICAL STANDARDS

The jungle task force should be especially selected as to physical fitness, and should be composed of very young men who will be able to withstand the hardships of this peculiarly exhausting type of service. The unfit, physically weak, and elderly personnel should be eliminated before this special military operation is undertaken. Our troops on Bataan were amazed at the extremely youthful appearance of the Japanese prisoners of war.

SPECIAL TRAINING FOR JUNGLE WARFARE

Very important for all the force—including attached units, especially the medical troops attached. Six to eight weeks are considered necessary to acclimatize the troops to the increased temperatures, the rains, humidity, etc., incident to the tropics. As a further hardening process, two or three months additional training *under actual jungle conditions* should be carried on before troops would be considered ready for the special operations. Litter bearers should also train in the jungle to be able to carry loaded litters long distances over jungle trails. Combat troops will not enjoy littering the litter-bearers, as sometimes actually happens. Pack animals should be conditioned with their loads out on the hilly jungle trails in order to be fit.

It has been reported (unofficially) that the Japanese trained for about one year on the tropical island of Hainan off the China Coast before starting their Philippine campaign. Apparently they were well fit for their job.

VACCINATION

This should be accomplished as prescribed by Army Regulations and War Department Circulars, and must be carefully checked to determine if all the troops have complied. This should be attended to by the medical officers prior to departure.

PERSONAL HYGIENE

Dehydration and Chilling.—High temperatures and the humidity of the tropics cause a tremendous amount of sweating, resulting in great loss of water, salt, and vitamins from the body. A state of dehydration may develop, with early symptoms of pronounced headache, exhaustion, abdominal and muscular cramps (soldiers call them "salt cramps"). These symptoms may be confused with appendicitis, and they may be aggravated by the rapid cooling of the sweat-wet body of the individual.

Experienced soldiers with good water discipline are seldom affected with these heat cramps, as they have been trained how to take care of themselves. In addition to the cramps and the accompanying intestinal upsets, affected troops may also develop respiratory infections, namely sinusitis, bronchitis, or even pneumonia, often a result of sleeping in wet clothing directly on the wet ground. Permit the men to strip to the waist, remove the wet clothing, and attempt to dry it out, thus reducing the chances of becoming chilled after the day's work. A dry undershirt or shelter-half to cover the chest and abdomen at night proves most useful for the men.

The troops must not sleep directly upon the wet ground, and in Panama it has been the custom to construct small platforms ("wiki-ups") up off the ground, place thereon a layer of palm fronds, then erect the mosquito bars and shelter tents, thus insuring a dry sleeping place for the men even in the rainy season. Hammocks may be slung if available and if the situation is favorable.

Water Discipline.—Good water discipline among the task force should be required, and experienced troops learn how to conserve their water supply and how to avoid heat cramps and intestinal upsets. From training they learn how to drink "by the numbers"—taking small swigs of water frequently and at regular intervals. Gulping water should not be permitted when men are overheated.

The medical service provides salt tablets and chlorine tablets (Halazone) for the men, and the placing of ¼ teaspoonful of salt, plus one or two chlorine tablets, in the canteen of water at the time

the canteens are filled will be found simple and effective. Increasing the amount of salt in the diet may suffice to replace that lost from sweating and, with sufficient water, thus help reduce the heat fatigue and exhaustion incident to severe exertion on the jungle trails. A proper salt and water level in the body assures better physical efficiency and endurance.

Ability to Swim.—Every man in the task force should be able to swim, as there are a great many streams to be crossed in the jungle and cases of drowning are not uncommon.

Feet and Skin.—Feet should be inspected frequently, as numerous foot infections will be encountered, especially trycophytosis ("Dhobie"). A plentiful supply of sox should be available, troops should change their sox daily, and foot powder should be used freely. Some of the men will go barefooted, in which case they should be examined later for hookworm infestation. Before wading streams, the men should remove their shoes and hang same around their necks or over their shoulders. This helps save shoe leather during the "dry season." During the "rainy season" this is of no value, as the shoes are continuously wet anyhow. Armpits and groins should be washed with soap and water daily, then dried and powdered. Frequent skin inspections are desirable precautions.

Malarial Fever

This is a very serious disease for troops, as it is disabling and is not quickly cured. It is world wide, notably in the tropics and subtropics and "has been a serious difficulty in the Carribean area, in Africa, in the Southwest Pacific, in India, and elsewhere."

It is transmitted from man to man by mosquitoes which have sucked up a drop of infected blood, the malaria germs increasing in the mosquito's body after about 10 days, when the infected saliva of the insect—after a bite—will enter through the skin into the man's blood and infect him.

What can a soldier himself do to prevent malaria? Use sleeping nets, protective clothing, and repellants, and avoid infected native villages, which are particularly dangerous after dark. American troops, even with malaria, are still able to carry on combat successfully, as was demonstrated in the Southwest Pacific area.

Chemical Prophylaxis.—The following is quoted from Circular Letter No. 56, Surgeon General's Office dated 6-9-41: "The use of quinine or atabrine for prophylaxis is not recommended as a routine procedure, as the available information indicates that these drugs do not prevent infection. However, they are of definite military value in that they do prevent the appearance of the clinical symptoms of malaria so long as they are taken, and thus they afford a means of keeping troops 'on their feet' during periods of emergency in the field. When administered to troops in special situations in unsanitated endemic areas either of the drugs may be used under the personal supervision of a responsible officer, as follows:

(1) Atabrine 0.2 gram (3 grains) twice a week (every 3 or 4 days) or—

(2) Quinine Sulphate 0.3 gram (5 grains) daily."

Any toxic symptoms developing must be reported to the medical officer.

Other Measures.—Men working in kitchens or on picket lines at dawn and at dusk, should be protected by requiring them to use gloves, headnets, and chemical prophylaxis as they are much more exposed. Men sitting around company canteens at night should be likewise protected. Headnets for night patrols should be stained black to aid vision. The use of mosquito bars (small 20-mesh bobbinet) should be SOP for all troops while sleeping, and this should be insisted upon by all commanders. This cannot be too greatly stressed, and should be carefully checked and necessary disciplinary action taken in the case of violators. Camp or bivouac sites should be carefully selected, fairly high up and at least one mile away from swampy areas or *native villages.*

Repellants.—Citronella-Camphor-Petrolatum mixture will be found useful by certain classes of night working clerks who are unable to wear headnets. Others may use it.

Dysentery

Dysentery may be considered very prevalent among natives, and the use of water and food from native sources should be prevented. Food so obtained should be regarded infected, and this would call for thorough cleaning and scrubbing, with *boiling* of food before eating. The proper cleaning of the messgear of the troops after each meal will give good results, and there will be times when only the *spoon* will be available when subsisting on "C" rations in the forward area of contact. Drinking water must be disinfected through use of one or two chlorine tablets (Halazone) to each canteenful.

Venereal Diseases

Very prevalent among the natives, whose moral standard may be considered none too high. The barter of cigarettes, tobacco, candy, chocolate bar or other food, a cake of soap, or even quinine tablets (very much in demand by natives) may provide the soldier with the desired sexual contact. Keep the men away from the native villages, and have available prophylactic stations which should be well marked and their location known to the command. Instruction in V.D. prevention and good *discipline* of troops will show results here.

Insects and Snakes

Ticks, Leeches, and Chiggers should be sought for once or more daily, and ticks and leeches carefully removed. A wet cigarette butt or some grease will

loosen them, making removal easy and complete. Tweezers may be used, then touch the wound with tincture of iodine to disinfect it.

Chiggers may produce extensive skin lesions. Powdered sulphur in sox and around the waist band may lessen the number of bites. Phenol ointment or lotion or iodine may be used. Avoid sitting directly on ground, dead stumps, or logs.

Sand Flies are a nuisance at night, irritating and persistent. Use mosquito bars.

Snakes.—Many poisonous snakes thrive in the tropics, in Central and South America, in Australia, and in the East Indies. The Cobra is found in Malaya, in India, and in the Philippines. Troops should be instructed how to prevent being bitten by snakes and they should be cautioned against walking around barefooted or placing hands on ledges or logs where they are unable to see what is there. Most of the bites are on hands and forearms, feet, ankles, and lower part of legs. The actual number of persons bitten is relatively small—*deaths rare.*

The company aid men should be well qualified to give emergency treatment for snake bite by applying some form of tourniquet (shoe lace), incising the wound, and *massaging and sucking it at once.* Kill the snake for identification and send for the medical officer without delay. *Keep patient quiet, at rest.*

Native Villages

Every native village in the tropics may be assumed to be infected with venereal diseases, typhoid and dysentery, smallpox, malarial fever, intestinal parasites (all types); and in the Southwest Pacific, possibly plague, cholera, and typhus fever. During a campaign these villages and native huts should be shunned by the troops and patrols should be placed to see that troops do not enter for pleasure purposes. *Off limits!* Camping in the immediate vicinity of native villages is a very undesirable procedure. One mile away for the camp (bivouac) is good SOP.

Field Service in Tropics

Troops should be relieved at short intervals for rest and recuperation if the tactical situation permits, otherwise a large non-effective rate due to illness will develop. Send them to a rest camp in the hills to get some good food, rest, and sleep.

Evacuation

In the jungle or in mountainous country this will present many and varied difficulties on account of the climate and terrain, and the flow of the disabled will be along trails, streambeds, streams, and lakes. It has been noted from past experience that there may be three or more echelons of evacuation in getting casualties removed from the forward areas to a point where definite treatment may be carried on successfully. These echelons may fall into the following classes:

1st Echelon.—By hand carried litters, with probably only two men to the litter on account of the trail being so narrow and difficult. Supplement this form of evacuation by using prisoners of war or impressed native coolies who are physically qualified as porters or cargo bearers. The use of hammocks slung on bamboo poles may prove effective, with only a two-man carry. Litter relays will have to be established for relief of the litter-bearers if the distance to be traversed is very great, as this work is extremely exhausting.

2d Echelon.—Animal transport, possibly from the pack train, may be introduced here where the trail becomes better and wider, using the following: (1) The travois[1] (old Indian type) may be used. (2) The cacolet[2] type of evacuation, 1st Cavalry Division, may be employed. (3) With docile pack animals, an ample supply of blankets, surcingles, and feed bags (or gunny sacks) for patients' feet, the disabled may be strapped to the animals' backs—head facing the rear—as Allenby found necessary in the Palestine campaign, in order to get them out. A considerable degree of safety and comfort is thus afforded, and the casualties may thus be gotten out to an evacuation point called a "jeep head" where small ¼-ton ambulances take them to an established portable hospital or field hospital providing surgery.

3rd Echelon.—Arriving later at a navigation head on a river or lake, native cayucas, single or in convoy, may then be introduced, with the view to getting patients to a point where army motor supply boats, air transport, or hydroplanes should be able to take over and transport patients to the hospital where definite treatment will be carried on.

This method of evacuation may seem rather crude and lacking in the refinement of a metropolitan ambulance service, but it is practical, has been tried out under actual jungle and mountain conditions and it will work. "No one method of evacuation will do. It is rather by a combination of the means available that the collection and transportation of the sick and wounded can be accomplished."

Summary

The following precautions have been recommended by surgeons for the troops fighting under jungle conditions in the Southwest Pacific area:

1. Wear *long* trousers and *long* shirt sleeves to protect the skin. Disinfect skin abrasions or cuts with Tincture Iodine carried by the soldier.

2. Sleep under mosquito *bar,* tucked in well, and *kill any trapped mosquitoes.*

3. Sleep *dry.* Avoid lying on damp, *wet* ground. Avoid using native huts.

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[1]Travois: a vehicle consisting of two trailing poles serving as shafts and bearing a platform, net, or litter for the load.

[2]Cacolet: a horse or mule litter used for the transportation of wounded.

4. Use head net and gloves when out at night. Also use repellant ointment.

5. Don't fail to take your quinine daily at supper —helps prevent malaria.

6. Bathe daily using plenty of *soap.* Use powder on sore or chafed spots.

7. Wash and change *sox* daily, and use foot powder on feet.

8. Wash clothing at least twice a week, and *dry* out same.

9. Don't drink water from unauthorized sources, unless properly disinfected. Use 1 or 2 Halazone (Chlorine) tablets to each canteen of water.

10. If wounded take *Sulfa* tablets as directed, dust wound with Sulfa powder from 1st Aid packet and apply dressing.

11. Move *away* several feet from the trail—out of sight of *Jap sniper*—and call for *help* in quiet voice.

12. Don't lose or forget your Jungle *Medical Kit (it may save your life).*

Conclusion

Well disciplined troops, experienced with jungle training, will not find service under jungle conditions prejudicial to a reasonable state of good health —but they must be *well disciplined* in every sense of the word. *Study and know the jungle, and thus make it your ally! ! !*

Notes on Mobile Surgical Units in the Middle East

[From an article in the *Journal of the Royal Army Medical Corps* (Great Britain) January 1943.]

1. Mobile Surgical Units of all kinds should be flexible in themselves and should be handled freely and flexibly. They should be equally capable of working at the Base (at General Hospitals) or in the Forward Areas and they should be distributed according to the needs of the situation. If a particular corps is suffering heavy casualties a dozen teams may be needed for a few days. At other times a couple of teams can easily cope with all the work. And in very quiet times there will be very little work at all in the Forward Areas; at such times most teams will be better employed at the Base. Should a battle be about to start it is easy enough to push up a dozen teams in a couple of days. There is no need to keep all these surgeons idle in the Forward Areas for weeks before and after a battle. Whenever possible each team should be specially trained in some specialty that will serve to keep it out of mischief in quiet times. In battle each team can do general work as required.

2. The question of holding sections.—Is the team to care for its own patients or not? If so, is it to carry its own tentage and other necessary equipment and to have the necessary extra personnel? My own view is that the team should not be required to carry accommodation for patients. It means extra transport and work when the team's energies should be devoted solely to treatment of patients. But I do think that the team should be responsible for the post-operative care of its patients and should have its own nursing orderlies trained to this work.

3. Personnel of Surgical Teams.—There is room for two types of team in the Forward Areas; the extremely mobile team running one table, and the rather less mobile team running two tables, but of much more than twice the capacity and very economical in personnel and equipment.

4. What is the ideal theater accommodation?—It is not safe to count on finding buildings. Should operations be done (a) in a tent? (b) in a pent-house built round a lorry? or (c) inside specially equipped lorries? The great advantage of operating within the vehicle is speed of getting to work and of packing up. And packing up is far more important. You may have plenty of time to pack up and "beat it" if the enemy is approaching or the first warning may be a shell in the camp. And five minutes may be all the time one has to get going for tanks move fast. The trouble about the few units possessing actual operating lorries is that the vehicles are far too small. (In Kellar's unit the anesthetist told me that it was sometimes necessary to anesthetize the patient before he could be got inside the vehicle and placed on the table.) Do you remember my mentioning to you certain vehicles used as Mobile Map Printing Units? These are the answer to the theater on wheels. They are expandible so that the floor space can be quickly doubled. Such a vehicle, plus a similar vehicle fitted as a sterilizing van which could be joined back to back would give space enough to run two tables concurrently, with the advantages of this system.

The alternative to such mobiie theaters is, I think, the specially designed pent-house tent built round the lorry, on the lines of our own. The lorry itself does not require elaborate fittings. Such as there are should be made accessible from the outside so that, when the pent-house is erected round the lorry, equipment and stores are readily and easily available. There is an Australian Mobile Surgical Unit van which embodies certain good points on these lines. The main feature about the construction of the vehicle internally is that all the fittings, cupboards, shelves, etc., are made of metal or metal-covered ply-wood, combining lightness and slimness with great strength and freedom from warping.

Trailers are a mistake for they are the very devil on narrow roads and in the desert. On narrow roads they won't go round the bends and in the desert the bumps are always causing the couplings to snap.

5. Other points concerning transport.—It is very bad policy to overload vehicles. In bad country it is unsafe. If a vehicle is loaded to the roof, packing and unpacking take twice as long and, if a particular article is required in a hurry, it is always at the bottom of the pile. . . .

Conclusions.—Were I to have the designing of my own ideal unit, I should plump for the expandible lorries, one as theater, the other as sterilizing room, and the two-table system with two surgeons. And I think that if that were not obtainable I would have the single-team operating lorry for the most advanced sporadic work and the two-table pent-house arrangement for the heavier work a little further back. . . .

Service Areas of the Infantry Division

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EXPERIENCE in North Africa has indicated the necessity for clearing the fighting area of service and supply transport and personnel not required for the immediate support of combat troops. The presence of these elements in the forward area operates as an obstacle to freedom of combat maneuver and unnecessarily subjects them to hostile fire and the action of raiding parties. The establishment of a divisional service area permits freedom of maneuver of combat units within the division zone of action and provides coordinated security and closer control of administrative and service elements during combat.

Tables of organization do not provide personnel or equipment for the specific purpose of coordinating security measures and establishing central control over the unit and service trains of the infantry division. A system designed to clear the division combat area of transport and personnel not necessary to combat must be improvised from available means. The following general plan has been developed with a view to clearing the forward area and providing central control and coordinated security for the elements involved. No attempt has been made to establish minute details. Some are adaptable to standing operating procedure while others are matters for decision which should be made in conformity with demands of the situation.

The entire scheme is based on the formation of a Division Service Area (DSA). This area may be defined as an area in which are grouped all division service and administrative elements, unit transport, and personnel not required for the immediate close support of combat (see schematic diagram). Following are listed factors which govern the location of the DSA:

Relation to area required for combat maneuver.

Proximity of friendly troops and reserves.

Availability of supplies and services to combat troops.

Location of terrain providing defilade, natural defensive strength, cover and concealment, and suitable routes forward and to the flanks and rear.

Travel time of unit trains.

In offensive operations the DSA may be located from ten to fifteen miles in rear of front line troops. In defense this distance may be increased to twenty-five miles or more. The foregoing distances should be applied with caution. Troops must be adequately served and at the same time be reasonably safe from minor hostile ground action.

The division commander appoints a commander of the DSA from available personnel. Following are some of the more important duties of the DSA commander:

Tactical command of all units and attachments in DSA.

DSA security.

Control and security of movement of division and unit service and supply transport from the DSA to point of release to units.

Movement of DSA to new location designated by the division commander.

Selection of DSA when not designated by higher authority.

Submission of request for security attachments when necessary.

Maintenance of Administration and Traffic Circulation Maps for own information; data furnished by G-4.

Transmission of orders from the division commander and commanders of service elements and unit trains to individual units and groups under his tactical command; he prescribes their routes forward and provides armed escort when the situation requires.

(The DSA commander has no jurisdiction over the functional operation of the various trains and services under his control.)

The following units and attachments are normally grouped in the DSA:

Divisional and Unit Trains:

QM Company.

Rear echelon of Division Headquarters to include attached personnel sections of units.

Elements of the Medical Battalion, Engineer Battalion, Ordnance Company and Signal Company.

Unit rear echelons and trains and personnel not immediately essential to combat.

Non-divisional:

Attached organizations together with small corps and army units may, for security, be included in the DSA.

The organization of the DSA for security and the conduct of security operations are the direct responsibilities of the DSA commander. Security measures are based on the following:

Exploitation of the natural defensive strength of terrain through the establishment of road blocks, minefields, and other artificial obstacles.

Division of the area into sectors and the assignment of responsibility for each sector.

Coordination of the employment of all available weapons within the DSA.

Establishment of a mobile reserve. (Reserve primarily made up of clerks from division and attached unit administrative personnel.)

Application of passive defense measures such as dispersion, camouflage, concealment, blackout, and construction of fox holes.

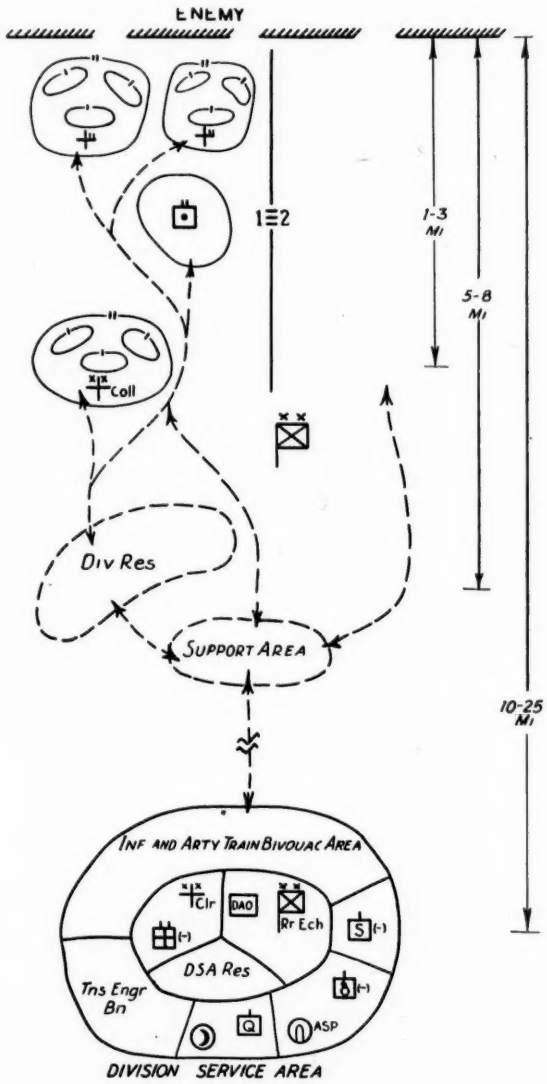

DIAGRAM
DIVISIONAL SERVICE AND SUPPORT AREAS
(SCHEMATIC - NOT TO SCALE) 260

The DSA is organized for all-around defense. Organic weapons of all elements within the area are accordingly sited. Elements of the antiaircraft artillery battalion, attached to the division, should be made available for air and ground defense. The DSA reserve is promptly employed to prevent penetration of the area and furnishes armed escort for train movements when enemy raiding parties have succeeded in penetrating the division position.

Under certain conditions of operation it may be necessary to locate the DSA at such distance from the combat units as to preclude close support by unit and service trains. When such conditions exist a Support Area is designated. The Support Area may be defined as a temporary advanced service area, intermediate between the DSA and front line troops, from which essential unit train and division service elements operate in close support of combat. When feasible, it is located near the reserve for incidental protection. Because the elements operating from the Support Area furnish service and support to all combat units along the front of the division, this area should be located centrally with respect to the division front. When the tactical situation requires that the division reserve be located toward a flank, it may be necessary to provide a small detachment from that reserve to provide additional security for the Support Area. Division service installations which may be located in the Support Area are the division ammunition office, the clearing station, and division dumps and distributing points. Personnel carriers of the motorized division are available for prompt use when located in the Support Area.

Certain unit vehicles operate with their units during combat and are always retained in the unit area, for immediate use, under direct control of unit commanders. These are primarily weapons carriers, command and reconnaissance, communication and ammunition vehicles. Remaining unit vehicles serve their units from positions in the rear, and are classified for convenience as "A" and "B" train vehicles.

"A" Trains consist of those unit train vehicles and personnel required for immediate combat. The following types are included:

Ammunition (additional).
Maintenance (2d echelon as needed).
Medical (unit).
Fuel and lubricants.

The number of "A" train vehicles and personnel is *not* a fixed quantity. Each situation will generally dictate the amount of immediate support required. "A" train vehicles and supporting detachments of the division supply and service units are grouped within the Support Area when established.

"B" Trains consist of all *unit* train vehicles and personnel not required for immediate support of combat. They are placed under division control in the DSA prior to combat and are released to units as required. Usual "B" train vehicles are kitchens, baggage trucks, and administrative vehicles.

Communications are requisite to the successful functioning of the system. It is contemplated that the primary plan for communications, in the functioning

of the DSA, will revolve around the facilities of the rear echelon of division headquarters. Supplementary communications must of course be improvised from signal equipment organic with units occupying the DSA.

Bear in mind that the general scheme outlined above is designed to clear the forward area of transport and personnel not essential to immediate combat, thereby permitting greater freedom of maneuver for combat units, and to coordinate security and provide closer control for unit trains and elements of the division rear echelon. The forward area must be kept clear of impedimenta not immediately contributing to combat.

Antisubmarine Command

[This is a digest of an article by Lieutenant Colonel C.A. Burrows in *Air Force*, April 1943.]

Prominent in the United Nations' program to control and eliminate submarine activity is a recently announced component of the Army Air Forces—the Antisubmarine Command.

This command is the only unit of the AAF within United States continental limits having a major operational mission, or "shooting job." Its crews patrol all coastal waters and escort merchant ships hundreds of miles out into the sea. In the offensive against U-boats they are not only prime attackers but serve as the eyes and ears for American surface vessels. Squadrons of the Antisubmarine Command also operate overseas—in any part of the world where enemy subs may be found.

Destroying enemy submarines from the air by land-based planes is definitely a development of this war. The job itself is not very spectacular. Tedious patrol, conducted for long hours, is the main work of antisubmarine squadrons, with occasional bursts of fast and furious action in which a plane has only 30 to 60 seconds to accomplish the sinking of a sub.

Origin of the command dates back to the beginning of the war. On 8 December 1941 the First Bomber Command began operations with the Navy against enemy submarines off the Eastern coast. A few months later, operational control of the First Bomber Command was placed under the Navy's Eastern Sea Frontier and Gulf Sea Frontier.

In the four months following Pearl Harbor the I Bomber Command and Naval aircraft cooperated with ships to protect unescorted merchant vessels from submarine attacks off our Eastern coast. Finally, in April 1942 the Navy started escorting coastal convoys, with air escorts continuing. Meanwhile, all operations continued to expand and, in October 1942, the Antisubmarine Command was formed with the First Bomber Command as a nucleus. The new and enlarged organization was prepared to operate on a world-wide scale.

Within the Command there are a number of Wings, which, for the purpose of receiving complete intelligence and operational data, coordinate their patrol area. At present, planes of the Antisubmarine Command are coordinated with the antisubmarine operation of the Eastern Sea Frontier, the Gulf Sea Frontier, and the British Coastal Command. Other wings of an enlarged Antisubmarine Command carry the fight to U-boats wherever they can be found in the world.

The job of tracking and locating subs is a slow task. Sightings from many sources are compiled to give a complete picture of the submarine menace.

Patrols in an area of more than a million square miles are directed from control rooms in New York, Miami, and overseas centers. In these rooms large staffs of Army, Navy, and Allied communication experts, plotters, and intelligence officers receive and evaluate reports of U-boats sighted. Here controllers give the quick orders which send aircraft and naval vessels to the attack.

Sometimes messages announcing sightings prove to be duds. However, the Navy and the Antisubmarine Command are careful to evaluate a message before wasting manpower and equipment on what might prove to be a wild goose chase.

Experience has shown that submarine crews fear aircraft. They will take their chances maneuvering with surface craft, but duck under water if they see an airplane in time. And they generally stay under if they know airplanes are in the vicinity. However, on rare occasions aircraft are fired upon by the guns of the U-boats who then submerge after the plane has passed overhead—if the plane hasn't already done the submerging job.

The tough aspect of submarine fighting is the flying day-after-day, in all kinds of weather and over wide stretches of cold, treacherous water. The strain of this sort of work is hard to measure.

Ordinarily, the average air crew untrained in spotting an object in the water will miss seeing something actually on the surface. This happens for a number of reasons. It may be because of the manner in which the surface is scanned or because of a type of eye fatigue that fails to see what is in the field of vision, or because what is seen fails to register on the consciousness of the person making the observation.

In order to réduce to a minimum these and other factors that tended to make submarine bombing from aircraft in the early days an extremely hazardous undertaking, the Antisubmarine Command has set up a special training program. The proper method of scanning the horizon, the correct manner of dropping bombs and other instruction in tactics and technique are taught by a squadron skilled in the business of tracking down subs. When the Antisubmarine Command receives pilots, co-pilots, navigators, bombardiers, radio operators, gunners, and engineers from Army Air Force Schools, they are immediately given this additional training. From this schooling a new type of combat crew is created which is highly skilled in "giving the business" to enemy U-boats.

Defense of a River Line

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A STUDY of military operations during the past two or three years would probably lead the casual reader to believe that a defense of a river line is not very much stronger than any other type of defense.

Certainly there is some ground for this trend of thought as many examples of successful attacks of river line defenses are to be found while few examples of successful defense of river lines exist. The Germans were not stopped by rivers in Western Europe nor in the Russian campaign until they reached the Volga. The Japanese in the Far East have certainly been successful in their attacks on river defenses in China, Malaya, and Burma.

However, a river does not simplify the task of the attacker. We know that even the smallest stream can constitute an obstacle and depending upon the degree to which the defender has organized the position, the more difficult the obstacle.

What, then, is the explanation of these unsuccessful attempts to defend river lines?

Instead of attempting to answer this question, let us look into the tactical features of the defense of a river line. With these in mind, perhaps some of the reasons for the many unsuccessful river line defenses we know of will be made plain.

We will limit ourselves to the defense of wide, unfordable rivers, such as the Missouri or the Hudson and not small streams 75 or 100 yards in width like the Marne or some of our smaller streams shown in the Gettysburg maps we are all familiar with. Wide unfordable streams restrict movement and maneuver. The attacker must have special training and equipment if he is able to negotiate the crossing in the face of hostile resistance. Likewise, the defender will have to make special preparations, both tactical and technical.

When is it possible to use a river as an obstacle in front of your main battle position?

In the first place, adequate forces must be available to conduct a defense along the entire stretch of river line to be held. The Russians used this type of defense and had the necessary manpower to cover wide stretches of river front and even then all they accomplished was delay because the Germans were able to force crossings in many places and the Russians had to withdraw to new positions.

In using this type of river line defense, the bulk of the troops are assigned to the main battle position with reserves fairly close to the river. The enemy must be stopped at the river for if crossings are forced at one or more points the defense has failed.

Another type of river line defense is that in front of a river such as the Russian defense at Stalingrad.

This type generally indicates that the offensive is to be resumed at some time or other. This was done at Stalingrad and all during the siege of that city the Russians were able to supply the defending forces by sending matériel across the Volga River although in some sections of the city they only held a strip a few hundred feet wide on the west bank of the river.

Another type of river line defense and the one most common is that of defensive-offensive action. One reason that it is the most frequently used is that it can be used with fewer troops than can the other types mentioned. The mere fact that we go on the defensive implies that at that particular time we are weaker than the enemy. The principle of economy of force requires that we use a minimum of men in the accomplishment of a mission and here Ol' Man River may well become our able ally; and, by carefully planning our defense, we will be able, with a minimum force, to hold a long stretch of river.

The principle that a defense must have depth, flexibility, mobility, and aggressiveness applies in the river line defense just as in any other defensive situation.

Depth is necessary to prevent the loss of the position in case a crossing is forced. Obviously, if we put all we have right along the river's edge, the enemy will find it extremely difficult to cross, but once a crossing is forced at any point he can concentrate his firepower and manpower on that point and get a large force across, and we will have nothing in rear to oppose him.

The defense must be *flexible* and *mobile* as the two go hand in hand. They enable us to shift our strength rapidly from quiet areas to those that are in danger. Since in the attack the enemy has the initiative, he can choose the place and time of his main effort. Our defense will have to be adapted to his actions. Of course we can attempt to deceive him as to where our strongest defense is located in order to influence his decision or we may, from our own terrain estimates and reconnaissance, figure out likely crossing places where he would be liable to attempt to force a crossing. Many commanders have failed in the defense of a river line because they knew when and

where the enemy would cross, or thought they knew, only to find that the enemy did not agree with them either as to time or place. A clever enemy, and we must admit that our present enemy is no fool, will in all probability plan crossings at several places at once but will not divulge his main effort until he has a chance to study the reaction of the defender.

The necessity for aggressiveness is self-explanatory. A passive defense behind a river in modern war has proven a failure many times in Europe. The French thought they were safe behind the Rhine but were overrun in a short time. The Belgian Fortress of Eben Emael was thought to be impregnable but lasted only a few hours under determined attack.

Some of the attacking force is bound to get across the river in spite of all the defender can do, so the use of fairly large mobile reserves is indicated in order to counterattack and drive out or annihilate any force which penetrates your position.

A successful defense may be maintained behind a river line *provided* the commander employs all his reconnaissance agencies to the maximum in order to keep informed of the enemy's actions, provided he occupies and organizes his position wisely, and keeps knowledge of this organization from the enemy, and provided that he has a strong mobile reserve which can be used against the enemy's main attack when it develops; in effect, while he has one foot on the enemy's side of the river and the other on his own.

Functions of Engineers in a Breakthrough

Engineer duties in a breakthrough operation are especially heavy and division engineers should, therefore, be reinforced by attachments of combat engineer units from the corps. In addition, corps and army engineers may take over engineer work in the rear areas as far forward as possible without encroaching upon the command prerogatives and the requirements for coordination by the front-line division commander.

The principal functions to be performed by the division engineers (reinforced) prior to and during the attack may be listed as follows:

a. Reconnaissance patrols to determine the nature and extent of enemy fortification with a view to preparing appropriate means and selecting appropriate points for the breaching of obstacles.

b. Assignment of engineer units to make the initial breach of obstacles covering the enemy main line of resistance.

c. Engineer units to accompany tank units to assist them in the passage of obstacles which can be expected to be encountered within the enemy position and rear areas.

d. Engineer units to accompany the assaulting infantry elements and assist in the location, marking, and passage of obstacles which may hold up the infantry.

e. Engineer elements to follow up the infantry attack and make a more extensive search of the enemy position in order to locate and mark all mine fields and clear passages for wheeled supply vehicles and other troops.

f. Engineer units to perform the normal rear area services including maintenance and repair of roads and especially reinforcement and reconstruction of bridges to provide for the passage of armored units, water supply, and engineer supply, especially with regard to standard explosive and special items such as bangalore torpedoes.

The engineer units which accompany tanks must, if possible, be provided with armored half-track personnel carriers in order that they may pass through difficult terrain and areas swept by the fire of enemy small arms.

The employment of the engineers in such an operation is closely tied in with the employment of all the other elements of the division so that it is essential that the division engineer keep himself constantly informed of the plans of the division commander and of commanders of lower units, especially of those of infantry and tank units. In addition, he must keep these commanders informed of the results of the engineer reconnaissance since their plans will be considerably influenced by this information. Where a strongly organized position is to be passed through, engineer reconnaissance will have to be conducted over a period of several nights in order to gain the information essential for the success of the operation.

In providing engineer units to accompany tanks, the type of men required are those with special skill in the handling of demolition equipment and pioneer tools, and special training in recognizing and dealing with all types of enemy mines. In addition, a few engineer officers and noncommissioned officers may be carried in leading tanks in order that they may be available for quick reconnaissance and estimates of the situation which will enable them to expedite the engineer work.

Engineers attached to the tanks will normally ride with the tanks through gaps in front line obstacles which have been created by other engineer units. The operation in clearing obstacles in the enemy rear areas must be characterized by great speed and audacity since, if the enemy is given time to organize his defense of those obstacles, the tank attack will probably bog down and an infantry attack will be required before the obstacle can be cleared and the advance continued.—(From "'Hell-Buggies' and the Engineer" in *The Military Engineer* March 1943.)

Armored Field Artillery in Combat

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ROLE OF THE ARMORED ARTILLERY

THE TASKS of the field artillery in the armored division can best be understood if you will look at the table of organization of the division. You will be impressed with the large number of cannon that are in the division. In fact, the armored division is really a cannon division. Most of these cannon are intended primarily to be used as direct-fire weapons, and a large part of them are mounted on the tanks. These tank weapons are backed up by the assault "guns" and mortars. Close behind this array of cannon the division field artillery provides the *massed* fires to neutralize hostile opposition that cannot be readily overcome by direct laying methods. The artillery can mass its fires only when operated as batteries and far better when operated as battalions. To break it down and employ it as individual pieces merely adds a small number of weapons to the already large number of direct-firing guns. It prevents the artillery from massing its fires and deprives the commander of the great flexibility of fire that is inherent in the arm and that has been built in at such a great price expressed in training time. Let me implore you, therefore, if you are ever in authority to think twice before breaking an artillery battalion into batteries, and to think ten times before breaking down a battery into individual pieces. It is better to use some of your tanks or assault guns for such missions.

GENERAL TACTICAL EMPLOYMENT

The battalion is the basic tactical and fire unit. When one battalion composes the artillery of a combat command, the artillery battalion commander becomes the combat command artillery officer. Liaison, either personal or by means of a liaison officer, is maintained at the combat command post. At times two or more battalions are made part of a combat command. In this case the division artillery commander can be sent to the command to take over the artillery, or the senior battalion commander can act in that capacity. It is considered better to send the division artillery commander because the bulk of the artillery is now with the combat command and also because a battalion commander has enough to do in running his own battalion.

In this connection, let me remind you again that the organization of the combat command is very flexible and one command might have two artillery battalions now, but a few minutes later another command would have the two battalions. In an infantry division, we say that artillery is never held in reserve. In an armored division it is held in reserve at times, but only long enough for the division commander to determine where he can best employ it. It is not held in reserve in the same way that an armored or infantry battalion is held.

OFFENSIVE COMBAT

The primary role of an armored division is offensive combat. It acts with speed and boldness, seeking out the hostile soft spots and then striking suddenly. Armored artillery is organized, equipped, and trained to assist that type of action.

a. March.—The division is organized into combat commands and division troops for marches. Generally one battalion will be with each major subdivision. The artillery should march well to the front. To be more specific, there are several places it can be placed:

1. Entire battalion immediately in rear of the advance guard.
2. In the space between the tail of the advance guard and the head of the main body.
3. One battery at tail of advance guard and remainder of battalion with main body.
4. Entire battalion at head of main body.

There is little choice between these methods. I personally believe that at the head of the main body is best; however, take your choice. The important thing is to have it well up where it can be used early in the action to cover the development of the main body.

b. Meeting engagement.—When the advance guard is slowed down by hostile action, the artillery battalion quickly occupies position with one or more batteries to assist in overcoming the resistance. The number of batteries that are emplaced initially depends on the speed with which the advance guard can continue its advance. The slower the advance the more batteries emplaced. As the advance guard continues, it is supported by advancing batteries by leapfrogging them forward. An artillery observer is always with the leading elements of the advance guard. He calls for fire in accordance with the needs and desires of the advance guard commander. If the hostile resistance stiffens and the column commander, acting either under mission-type orders or as the result of a specific order for the division commander, decides to attack, the artillery gives close support in the initial stages of the attack. An artillery preparation may precede the attack. At any rate, the artillery will cover the development. Once the attack is launched, fires will be observed concentrations delivered on hostile resistance holding up our advance. These in most cases will originate with the artillery forward observers. The minimum number of observers that must be out is one for each armored or infantry battalion engaged. In most cases there will be many more. Even though there is no artillery observer near you, there is no excuse for you to be without artillery support if you need it. Every officer in an armored division *must* know how to adjust artillery on targets of opportunity. The artillery has developed a very simple system of adjusting fire on targets, a system that can be understood and applied by anyone after an hour's study. This is explained in FM 17-62. If you understand this system you need never be without artillery support. If you become confused and forget the exact commands that are supposed to be used, just tell the artillery in your own words what is wanted and they still will be able to deliver the fires. Of course the latter method is wasteful of ammunition, but if you can do no better get the fire some way—that is the important thing.

As the attack progresses, batteries of the battalion will be displaced forward frequently. New positions are boldly occupied close up on the leading wave of tanks. Artillery stay close up behind the attacking tanks, not only to insure better artillery support, easier control, and simpler communication, but also to minimize the interference of enemy groups which the tanks have not been able to overcome.

After reaching the objective, or even before, it will be necessary for the attacking units to occupy a rallying point in order to reorganize. At this time armored units are most vulnerable. The artillery should be in a position to protect the reorganization. At this stage its fires will be in the nature of defensive fires including normal barrages.

c. Attack against a fortified position.—In this type of action, armored divisions will be used as an enveloping force to strike the hostile troops from the rear while they are contained on the front by infantry units, or the front will be ruptured by infantry divisions and the armored divisions only committed to action after the infantry units have gotten through the hostile organized defensive area. In the first case, that is, the envelopment, the armored artillery is used as was described in the meeting engagement. In the latter case, that is, the penetration, initially the armored division artillery will have a minor role, if it fires at all. The preparation and fires in support of the infantry division attack will be coordinated by the corps artillery officer.

If the armored artillery is used during this phase it must be released early enough to accompany the armored elements when they advance.

After the hostile fortified area has been penetrated and the time has come for the armored division(s) to move forward, the artillery should move in rear of the leading tank waves and should remain mobile just as long as possible, the armored formation getting artillery support initially from the artillery of the infantry divisions that were used in the early attack. The armored artillery should occupy positions only when it is necessary to do so in order to assist the tank battalions which have run into opposition that threatens to hold them up. The whole idea of employment of armored artillery is to start it out initially well forward in the formation and keep it mobile as long as possible in order to be sure to have the necessary artillery support for tanks after they have gotten deep in the hostile position and run into serious resistance.

d. Defense.—The primary role of the armored division is offensive. In the defense its usual employment is as a large counterattacking unit for the higher headquarters. In such a role the division is employed as in any other attack, and of course the artillery will follow the methods that we have just discussed.

There may come a time when the armored division does have to occupy a defensive position. In this case it is customary to use the armored infantry regiment to occupy defensive areas, and the tanks are used as a counterattack force. In this case the artillery should be in position to support the infantry but with plans prepared to assist the counterattacks when launched. The employment of the artillery to support the infantry follows the same methods as when an infantry division is on the defense.

Employment of Tanks as Artillery

As has been pointed out, the armored division has many cannon. The armored units are trained to deliver fire primarily by direct laying. However, they do receive training in simple indirect methods. As a result of this the armored units are capable of assisting themselves by massing fires. Reserve tank battalions are particularly capable of rendering this

assistance. Another time that tanks may be used to fire artillery-type missions is prior to the attack; say, during the preparation. What has been said applies equally well to the assault guns and even to attached tank-destroyer units. When using these weapons, consideration must always be given to ammunition supply.

TARGETS

The worst enemy of the tank is the antitank gun. The mission of armored artillery like any other artillery is to assist its supported unit in accomplishing its mission. Since armored units are employed primarily in the attack, the primary mission of armored artillery is to silence the hostile antitank guns. There will be other missions that it may and should be assigned, but above all it should always remember that if it knocks out the antitank guns our tank attacks have a much better chance of success. With its curved trajectory weapon it is far better equipped to cope with the antitank gun than is the tank itself.

Hitler's Bodyguard Battalion

[Translated at the Command and General Staff School, Fort Leavenworth, Kansas, from a German article in *Die Wehrmacht* 23 December 1942.]

On 28 December 1939, the Führer's Bodyguard Battalion was formed under the command of the future hero of Africa, General Rommel, for the military security of the Führer's headquarters and the general protection of the Führer himself. Thus, above all others, the Führer's Bodyguard Battalion was given the responsibility of protecting the greatest treasure of the German people—the Führer—from all harm.

Since that time the companies of this battalion have accompanied and protected their supreme commander on many trips to the front both in the west and in the east, and have discharged their difficult and glorious task with the greatest alertness. Under their protection the Führer has been able to pursue his strenuous labors in peace and to lead the German armies on from victory to victory, surrounded by his faithful soldiers who are always ready for action.

The men are chosen from the *Grossdeutschland* infantry division and while they are employed as an independent battalion, these battle-tested troops of the Führer's Bodyguard Battalion have never lost contact with the front. Officers, noncommissioned officers, and men frequently change places with men from the *Grossdeutschland* infantry division and return to the front for the opportunity of proving themselves, in the face of the enemy, worthy of serving in the Führer's Bodyguard Battalion.

During the course of the past winter, on orders from the Führer, a combat group was formed out of the Bodyguard Battalion and employed in the northern sector. There, in many battles, the group has added to the glory of the grenadiers of the *Grossdeutschland* infantry division.

The particular duties of the Führer's Bodyguard Battalion demanded a unique organization such as is found in no other body of troops in the German Army. Almost all types of arms are represented in the battalion—light and heavy infantry weapons, armored scouting cars, tanks, the light army AA cannon, the best and most modern weapons that the Führer has given to the German armed forces in accordance with the principle of "the best arms to the best soldiers." Fully motorized and partly equipped with the "people's car" which has proven its worth in all theaters of operation, the Führer's Bodyguard Battalion is ready at any hour for action. It is highly mobile in any terrain and because of its excellent armament and equipment it possesses unusual combat power. For it is the highest aim of the battalion, besides the fulfilment of its faithful guard and security service, to be ready at all times not only to repel but to defeat and annihilate any enemy who may attack. The knowledge of the high responsibility and significance of this task is possessed by every soldier of the battalion. Each one knows that at any moment he may have to give his life in this service.

Thus the service in the Führer's Bodyguard Battalion is a service of the greatest honor for which only that person is called who has shown himself worthy of it as a soldier. Of course the daily service cannot be compared with the fighting of our infantry in the front lines. But in the hour of danger the individual fighter is of more importance here than in any other place. Hence a proving period at the front is obviously a requirement for membership in the Führer's Bodyguard Battalion. The many wearers of high, and even the highest, decorations in the ranks of the battalion testify to the spirit of the front line soldier who in this place is in his best place of duty.

But honor and distinction come to the soldier of the Führer's Bodyguard Battalion in other ways too. He plays his part in the great events of this, the greatest of all wars, in the places of greatest decisions. He participates in great historical events at the Führer's headquarters on the occasion of visits of the leading German personalities and also those of friendly states. Millions envy him the good fortune of being able to see his Führer in person, to witness how he labors day and night without rest or repose for the welfare of the German people. All these things form ineffaceable impressions that will stay with him his whole life long.

Therefore, service in the Führer's Bodyguard Battalion is one of the greatest honors that a soldier can have. To be a soldier in the Führer's Bodyguard Battalion means being the pick of the army.

In accordance with the will of the Führer, the 1st regiment of the *Grossdeutschland* infantry division has been given the appelation of *Grossdeutschland* Grenadier Regiment.

To be one of the Führer's grenadiers in his bodyguard battalion is a high ambition which must stand out brightly before the eyes of the German soldier.

Rangoon Falls

COLONEL ADRIAN ST. JOHN, *Chemical Warfare Service*
Instructor, Command and General Staff School

The writer was in command of U.S.-China Lease-Lend functions in Rangoon and on the Burma Road, including Mandalay.
—THE EDITOR.

THIS IS NOT one of those Public Relations scenarios written to glorify some individual person or group of men. It is a simple record of facts, good and bad, miserable in spots and perhaps humorous in others. It has an educational value somewhere between the lines, but real military education is hidden and never can be just absorbed from numbered paragraphs in field manuals.

It is difficult to paint a word picture of the city of Rangoon and its vital importance. And yet the reader must conceive that picture before he can understand this article.

Rangoon is situated on an inner bay, with a long dockage area along the bay and into the mouth of the Irrawaddy River which is no small stream but navigable for 900 miles through the heart of Burma. Rangoon's population is about 500,000. To easterners, it is comparable to Baltimore, the seventh city in size in the United States with a population of 692,700, and it is in a similar geographic situation, except that Baltimore taps many vital areas by rail, whereas Rangoon must receive 90% of its support over water. Rangoon had great department stores comparable to the best in Baltimore, and hotels superior, at least in rooms if not in service. Everything found in any typical American city of similar size could be found in Rangoon.

Now visualize the removal of everything in Baltimore to, let us say, Albany, N.Y., with all roads destroyed except one main highway, with the railroad and yards knocked out and the bay guarded by enemy subs and surface vessels. Have you the picture? What will the Mayor (or military) do with his local prisoners, the zoo animals, the fire department, the people in hospitals? I have mentioned only a few odd items. Never mind the stores and other businesses. That is simple. Everyone locks the doors and departs. Ships come in and deposit vast cargo on the docks, but it is left there. No labor to move it, no clerks to receipt for it, and no place to send it. It is free to the public if they can come with labor and transportation to move it.

Some one at this point will remark that it could all have been moved earlier, but don't forget that there were very few transportation lanes open, and for the 15 days prior to evacuation, every facility was controlled by the military for vital combat supplies. Your auto and your truck? You turned it in for the common good and then you started walking.

The events leading up to the evacuation of Rangoon will be briefly described, skirting tactical efforts and failures. This is not a critical article and it is not written in the manner of playing the football game from the grandstand, or alibiing the golf game in the locker room. The British fought a magnificent battle all the way up the Malay peninsula. The Japs plodded along with a slow steady rhythm until about 12 miles south of Moulmein (see map). In this action they had superior strength and superior equipment for jungle fighting. The Japs had complete air superiority, in fact the RAF seldom entered the land combat even for reconnaissance. The American Volunteer Group was a Chinese unit, operated by Americans in the pay of China, so their duty was to protect Chinese interests in Rangoon and along the Burma Road and they surely did a superior job.

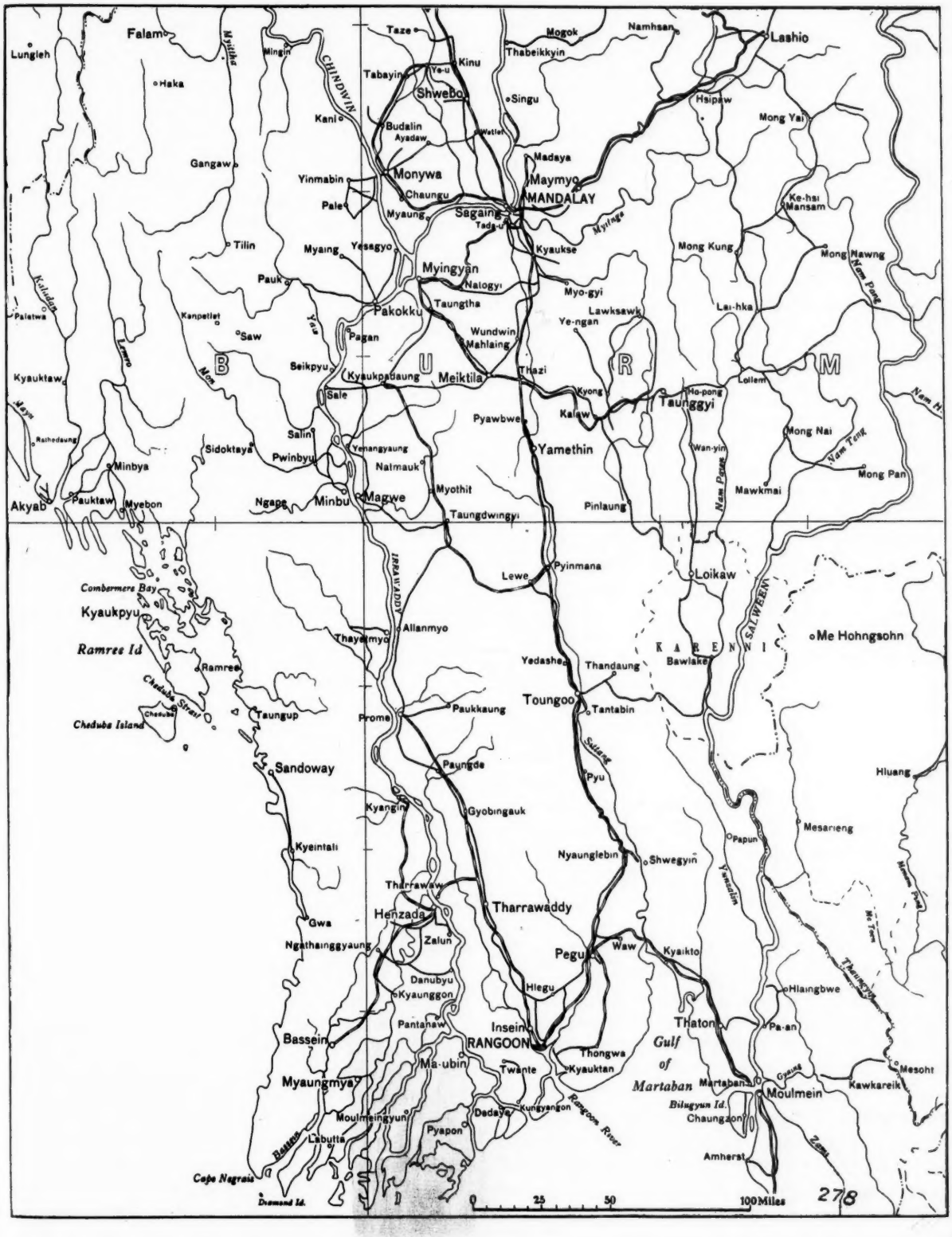
Because of the complete lack of air support, the Japs knew every move made by the British and could plan accordingly. Military movements in jungle fighting are slower than in desert fighting, and so advance information is more definite and twice as valuable. The Japs knew that the British were planning on a defense line behind the river and salt marshes at Moulmein. About 10 or 15 miles south of this defense line they threw in everything in rapid aggressive action. Small groups of 8 to 20 men tried to sneak through all along a broad front. When this infiltration was successful, the groups assembled at predetermined rendezvous points and formed rear assault forces. Other rear forces were sent around by boat.

After the loss of Moulmein and the defense of the Salween river line, the British kept swinging their defense positions parallel to the river lines—in other words they were locating defense areas in corridors rather than across corridors. They were not disposed for carrying out the basic mission which, at that time at least, was a defense of Rangoon, the Burma Road, and the river and railroad lines northward into China. Had they swung their line due east and west the terrain would have been better for defense and certainly much more difficult to outflank. Rangoon never had a chance after Moulmein fell.

At one time just before the action of Toungoo the British were completely cut off to the northward, south of the Sittang-Toungoo-Prome line, and it was only through the action of the tanks that they broke

through and eventually amalgamated with the Chinese armies moving in from the north.

For the benefit of tank men, it must be said that outside of this one operation the tanks and mechanized forces were absolutely useless in the entire campaign in Burma. They went into action many times between the Salween and Sittang rivers where the only terrain for their efficient operation was available. Even here they carried no weight, for the Japanese merely evaporated in front of their assault and later reformed behind the tank rendezvous areas and caused considerable damage to them. It must be remembered also that these tank battalions were moved from Africa where they had been fighting for



more than two years and they were no novices to tank action. According to the British commander they were from the best units in Africa, under the theory that they couldn't send very many but they would send the best.

After the entire front collapsed north of Mandalay, the terrain forced these tanks to go into action as defense artillery. That is, they sat on defense positions, held as long as possible, and then retreated to another position. This also is no criticism of the command or use of tanks. That type of terrain and jungle fighting is no place for mechanization; a few mules and horse cavalry would have more value than any mechanized group. Americans must not let their minds go single track on mechanization; the maneuver grounds of North Carolina and Louisiana are not the standardized terrain of the entire world. We must project our minds beyond the confines of army posts and camps, and not go all out for any single weapon. No machine ever had the brains of a man and we must base our fighting on the human being, aided by machines.

There were many other disastrous contacts with the Japanese but they can be covered at some other time when the campaign itself is written up. These remarks in regard to the fighting just north of Rangoon are inserted because they have a direct bearing on operations during the last days in Rangoon. It was stated above that the defense lines were parallel to the river and not east and west as protective lines for Rangoon. Naturally when these defense lines were turned on the north it was expected that the Japanese would head south and drive directly into Rangoon. This, however, was not done because the Japanese wisely attempted to drive due east and bottle the entire British Army in the southern part of Burma. They knew they could get Rangoon at any time they desired it. They did partly bottle the British Army south of Toungoo but as mentioned before the tanks smashed the bottleneck and the British Army escaped to the north.

When the defenses in the Pegu area were demolished, Rangoon itself quit. The Colonial Government by this time had already departed to the north and about 80% of the British General Headquarters and all their supplies had been transported north to Thazi and Mandalay or had been destroyed.

Now that the phases of the general tactical situation causing the loss of Rangoon are understood, let us go back to the early days in that city and proceed forward to that part in the campaign just covered, where the British broke through their encirclement and started on the second part of the action, namely the defense of North Burma.

The bad days of Rangoon started about December 16th with the first severe bombing and machine gunning. About 15,000 civilians were killed because the natives were bewildered and stood in masses in the squares and streets. There were no bomb-proofs available at that time anyway. The next bad air attack came as a Christmas present on December 25th. Many more thousands were killed and the population was at last educated. The construction of bomb-proofs started. Then came another lull in air activities. The AVG and the RAF were in action and they knocked the Oriental Canaries out of the sky as fast as they appeared. On January 1st and 2d more heavy raids came over with plenty of fighter escort and the city took a beating. From then on there were at least three attempted raids every 24 hours. The workers started leaving the city. Stores were closed. The docks and factories were deserted. But due to our protective air force of AVG and RAF the efficiency of the raids was greatly reduced, the people flocked back to the city, and some stores opened. The population grew accustomed to bombing and knew what to do. Once organized, only a very few casualties resulted. That condition is an interesting fact on recuperation by masses when once they gain confidence and education.

During the early bombings our ships were unloading Chinese Lease-Lend military and civilian equipment on the docks. The American military mission was operating three large truck and car assembly plants in Rangoon—two in the heart of the city and one in the open fields on the outskirts. Trucks were coming off the line in rapid, orderly fashion, clearing the civil demands, and grabbing up dock loads, and rushing up the Burma Road for China.

There is an interesting fact to note here, and one from which lessons can be drawn. Our military government school would do well to consider it.

Under the British system the Colonial Governor or representative ruler is superior to the military commander, even in a combat zone. He is the direct envoy from the King, whereas the military are merely representing a department of the government. This situation exists until the Colonial government gives up.

This is different from our American system. The American-Chinese group operated in the American fashion and worked directly with British military commanders, General Hutton at first and then General Alexander (now in Africa), by-passing all government rules and edicts. True, all civil institutions and forces should operate as long as possible, but the command, control, and operation of them should come under the military. Peaceful, civilian ways of life cease when actual combat hits the area.

Only a little of the havoc wrought by civilian rules (if followed) will be covered. In the case of car and truck assembly, when trucks were ready to roll from factory a long standard form had to be completed and sent in for a license. This form was similar to those made out in this country in peace time. The Chinese would send over these forms in bulk for cars assembled that twenty-four hours, along with a government check to pay for operating the trucks up the

Burma Road. Understand that these trucks in the early days just cleared Burma into China and did not come back. The trucks were assembled for use in China.

After the check was received and the form checked, a civilian official visited the factory, checked engine numbers, etc., and put a sticker on each engine and windshield. This procedure, considering the fact that the plant had to make up the tin license numbers, required a minimum of 5 days. Now visualize cars being stacked up in the factory yards awaiting nothing but a paper sticker! And heavy bombing daily to wipe them out. Naturally the only honest solution was to "bootleg" the tin plate numbers and move the cars. There were no police to check them anyway. To adjust this matter the Chinese sent a covering check for every group of vehicles as they left the factory.

Details of difficulties are always boring and generally give the impression of complaining. This is not the case here as our own group had the armored cars, guns, and ammunition, and operated as circumstances demanded. However, for information on similar situations, one or two other difficulties will be sketched in brief.

An attempt was made to apply all civilian rules regarding shipping. Docking was to be regulated as usual and under peace time priorities. Gasoline or oil could not be unloaded on docks even when it was on hatches which held vitally needed machine guns and ammunition and airplane parts for the AVG. All ammunition and inflammable substances were to be lightered in, and all the lighters were up the Irrawaddy river with thousands of tons of dynamite destined for Chinese railroad construction. This move itself had been instituted at the request of the Colonial Government. Also, ships could not clear without a great deal of official red tape of a purely commercial type. The nice thing about all this is that American ships' captains remained Americans. They worried about the commercial red tape but took orders from the American mission officers, and these orders were never given without the approval of the British military and the port naval authorities. There never was any real friction there.

Progress was made slowly from January 1st to about the 16th. There were 42 ships in the harbor on January 5th, and 5 were American. For some reason none was ever hit, although the docks were bombed and accidently burned twice.

From about January 16th to the 26th the Japanese radios from Thailand broadcast in English and Hindustani that they would take Rangoon between the 20th and 26th and completely demolish it. The natives believed in these broadcasts and the Buddhist priests carried along and nursed the idea so that thousands began leaving the city and work was about to stop. Since the British Colonial Civil Government had left, the Chinese Lend-Lease group brought in 2,000 semi-military laborers to carry on the work. Efforts had been made to do this many times before, but it was strongly opposed by the government and the Chinese refused to move in without their sanction. Anyway, with American mechanics and Chinese semi-military labor, the Lend-Lease group continued to function until about February 18th when further work seemed hopeless.

During this period the American-Chinese teams assembled about 300 armored cars (used in all later actions), over 700 jeeps, and on an average of 70 trucks per 24 hours. All this in spite of heavy daily bombing. The railroad, the river, and the road lines were soon (after about February 5th) open to the American-Chinese supplies as all the British army equipment had been moved northward.

At this time it was clearly evident that the Chinese Lease-Lend material could not be moved all the way from Rangoon to China and the evacuation of all matériel completed, since the haul was too great. From January 26th on, many decisions were important and most of those decisions had to be based on guess-work and luck since there was no such thing as aviation to gather information and no intelligence service to assemble or evaluate it. Everyone operated in the dark so far as the enemy was concerned, and yet at night *their* radio would tell us what *we* had done during the day.

As an example of one decision, two ships containing considerable arms and ammunition and parts needed for the AVG were permitted to dock, even though this was a heavy gamble since all air units had departed and rumors reported the Burma Road closed to Pegu. By tremendous effort one ship was completely unloaded (after February 15th), with the exception of heavy rails and other railroad equipment in the hold. The deck loads of the other ships were removed and all machine guns and ammunition and other essential military cargo was docked. It was fortunate that practically all of this material was in one hold. The gamble was worth it since every bit of this material eventually reached Lashio; whether it later got on into China is not known. Using the river, railroad, and the Burma Road itself, 17,000 tons per day were moved from Rangoon to Yamethin (see map) during this late period.

This decision to stop, unload, and reload at Yamethin was strongly contested, but the fact remains that the solution was successful. In the basic agreement the Chinese wanted to move every truck and every ounce of material clear to China, under the theory that a bird in hand is worth two in the bush. All of the terrain north as far as Mandalay is flat; none of the road grades would exceed a 2% incline. This permitted 2½-ton trucks to carry from 5 to 7 tons depending on bulk. Every truck and every heavy railroad car was loaded to its full capacity. Truck springs were wired with two-by-four braces to help carry some of the weight. Very few of these trucks had any breakdowns in the body or springs on the

trip to Yamethin, but a great number of them had accidents and engine trouble.

The system of moving the cargo was about as follows: A dispatch and control point was built up in a large flat area outside the limits of Rangoon. This position was well covered by trees and other foliage and had good road circuits. Two large groups of drivers were assembled and temporarily housed and partly fed there. A simple dispatch system was also employed. One set of drivers would receive instructions with the number of cars just completed and on the release line at the factory. Drivers would go to the factory in groups, pick up their trucks (just assembled), drive to the truck destination listed on their card, pick up the load, and return to the dispatch or staging area on the outskirts of the city. Here they would turn over their truckload to a road driver already designated to take over. The city driver would receive another card and repeat the process. This method worked very satisfactorily because the city drivers soon learned the dock and city area and very little time was wasted by lost drivers and trucks. All of the Burma Road drivers were familiar with the road and its hazards, and in each convoy group there were a number of old experienced drivers. All truck groups going up the road contained 25 or more vehicles, and had a leader and a pay man for ration money, etc. Sometimes a number of groups would be sent out at 10-minute intervals, but usually after three groups there would be a wait of more than an hour. The dock loading could not keep pace with the dispatch, even though three dock loading areas were used.

At Yamethin practically all trucks were unloaded and returned to the lower circuit in Rangoon. This gave us not only the trucks that were being assembled daily, but also older trucks to work with. The second circuit worked from Lashio to Yamethin and also northward from Lashio to Paschin. The authority of the Rangoon group only extended to Mandalay. Since north of Mandalay there were steep mountain roads, trucks would naturally have to be loaded to less than capacity rather than over capacity as on the lower road, but the entire operation was based on the theory of rapidity of movement south of Mandalay and availability of time for more leisurely movement north of Mandalay. This worked out, because while the American contingent and the last trucks moved from Rangoon on the night of 26-27 February, the Yamethin unit had until April to move that same cargo north into China. But naturally no one knew this at the time.

As mentioned before, from January 26th on, work began to cease as all the laborers were leaving the city and it was impossible to obtain food and other supplies. The British were evacuating personnel by ship to Calcutta. By about 12-15 February the assembly plants had almost stopped work. Except for the American mechanics there were very few native technical men and the few trucks being assembled were not coming off the line in usable condition. The American mechanics had to recheck and repair them constantly before they could move out of the yard, and this took them from their supervisory work. The men were all clamoring for their pay. The labor situation was bordering on revolt; the natives were entitled to their pay and at liberty to leave the country if they so desired. Orders were then given for the plants to fix up pay rolls and cease activities, and the men were paid off. There were no police or troops available to guard the pay roll or keep order in the labor lines, so the entire American officer personnel in armored cars performed this duty. Everything ran off in a very orderly manner. There was the usual bickering about overtime and underpay, but wisely the plant operating personnel had a complaint department and if the claim even had the semblance of honesty the man was paid. This was a good scheme because that attitude satisfied many of the key men and they stayed on in the plant, rigged up a number of partly assembled trucks, and helped drive them out at the last minute to the staging areas. Every nickel dispersed in this way saved many dollars in equipment.

On Washington's birthday, February 22nd, destruction of trucks started. By this time all of the British army with the exception of three officers on the staff and one transport plane had departed. All of the Colonial Government, fire department, police, etc., had left the city long before this date. Also all of the Chinese Lease-Lend authorities had gone northward and so had our last load of Lease-Lend material. There were some British sentries on the dock areas protecting a few military supplies which the British still hoped to move. The last ship load of evacuees had left the harbor. The natives were going in to all the stores and taking whatever they desired and also removing supplies from the dock. Personnel had been released from the prisons, and the insane asylums had been opened up. The reader can well imagine the havoc that this wrought, with the people already hungry and badly frightened. On the docks there were a few hundred cases of wine and whiskey which some of the natives had broken into and had grown over-enthusiastic.

On February 24th and 25th some of the American group made a reconnaissance north to Pegu on the Burma Road and were turned back by the British holding force south of Pegu with the statements that the Japanese had already cut across the road, that the fighting was still well to the north, and that apparently the Japanese were not going to attack toward Rangoon. Information as to whether or not the road to Prome was open was not available, so the group returned to Rangoon and that same night, after blowing up the last Chinese warehouse, moved up the Prome road and encountered no enemy.

Food was plentiful, for the group had taken ham,

bacon, cheese, crackers, and cigarettes as well as many other things from the dock area. In fact the American group lived better during the next month than any military personnel in Burma. The first destination was Prome as it was decided to check up on all vehicle columns from Prome northward. But the stop in Prome was not feasible since there were thousands of refugees in that area and cholera and plague had broken out. The reason for the congestion in Prome was that the best westward trails lead from Prome into India. Practically all of the American-Chinese vehicle columns and their loads had reached north of Pegu before the road was cut, or had taken the Prome road.

None of the columns was encountered until the group cut eastward to Mandalay and sent some reconnaissance south toward Yamethin. The reports showed very few trucks lost south of Yamethin, and those were burned and the drivers carried along on other trucks. Two members of the party were slightly injured by an explosion in one of the buildings during the destruction on the last night. One officer was in pretty bad shape so the party "holed up" for the night at one of the forestry bungalows and took plenty of time to repair all the damage, check the cars and the loads, etc. It was thought that we were now well ahead of the Japanese forces and could afford to move at leisure. This was based on the fact that it was assumed even then that the Japanese army had turned south for Rangoon. As a matter of fact the party was not very far ahead of the Japanese advanced units which were moving north instead of south. On the afternoon of the second day the party started northward again, crossed into Mandalay, spent some time there in contact with our American convoy leaders, in conference with the Burma Oil Company stations, etc., and later that night reached Maymyo, which a month later was to be our headquarters when operating with General Stilwell.

The advance headquarters, or really the rear echelon of the Rangoon office, had moved out of Rangoon for Maymyo early in February. All the records, typewriters, and office equipment, except desks, had been moved. All our extra officers, civilian girl stenographers, etc., had been moved at the same time. The National City Bank records and personnel and the American Consular Office had also been moved during this period. This had operated on a circuit system with no waste of truck space.

At Maymyo the new headquarters had been set up in the Baptist Mission School area. Motor park, gas storage, office space, and excellent sleeping rooms and mess were all in operation. The new food from the docks was a welcome addition, but the mess in return provided fresh strawberries and fresh cream. It was indeed a quick return to luxury, but as everyone knows there are as many ups and downs in a war as there are in a hod carrier's life.

Here the only duty was to get up reports, assemble all cars that had been loaned out, and get them in repair and ready for movement into China. Chungking was contacted, and finally orders were received to await the arrival of General Stilwell. This was the first news that the General was reporting to China and Burma.

Later in the week orders were received to proceed to Kunming, China, picking up enroute about twelve truck loads of supplies for the American Mission. These had been stored at Lashio at the American Red Cross yards.

Two officers were left at Maymyo as representatives to the British headquarters which had already established itself there. Prior to leaving Maymyo many of the Americans who had assembled there were moved to Lashio where they were evacuated to Calcutta by the China National Airways which was still in operation. It is interesting to note in passing that Lashio is the same number of miles east of New York as it is west of New York, and everyone was betting on whether it was better to get out eastward or westward since the distances were the same, but the American party knew the way they were to depart as the orders were specific—"on to China."

This ends the story of the Lease-Lend operation for China. The campaign went on for some time after this. At this period General Stilwell had just arrived at Kunming, enroute to Chungking to report. Some of the officers of the Rangoon-Mandalay group returned with General Stilwell to operate once again from the old headquarters at Maymyo, and to run out once more, only this time westward on foot instead or northward on wheels. This part of the campaign may be told in a later story.

A man cannot learn his profession without constant study to prepare especially for the higher ranks. When in a post of responsibility he has no time to read; and if he comes to such a post with an empty skull, it is then too late to fill it.

—Napier.

MP's–The Staff Viewpoint

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THE FUNCTION of the military police is to render close support to the combatant arms. Because of supply requirements, the ranks of the military police have been thinned to an absolute minimum. With such limited organizations, every general staff officer must strive for more highly trained men used on more economical standards than presently obtain. It is the duty of every general staff officer to understand the functions of the military police and to put his American ingenuity to work to devise more efficient methods for their employment. This article is written with that purpose in mind.

In order to accomplish this, three general precepts should be followed. First: *Don't fritter away trained military police on unimportant tasks.* Because the military police unit is adjacent to the division command post, too many general staff officers are apt to call upon this unit for messengers, orderlies, chauffeurs, and other minor assistance. If you want your military police to be of real service, resist that temptation!

Second: *Require the Provost Marshal to maintain close liaison with every General Staff Section.* As a special staff officer, the Provost Marshal is vitally concerned with the movement of the division, with the handling of prisoners of war, with the prevention of straggling, and with the control of civilians. He, therefore, deserves a place in the command post where he can keep abreast of the tactical situation. Most of his time will be spent in reconnaissance, but his home may well be located in the G-1 section. When he is out on reconnaissance, one of his officers or his staff sergeant takes his place for liaison purposes. The Provost Marshal must have early and detailed information which he can transmit to his men on post. Information for which the individual truck driver, the wounded soldier, the courier, the motor column commander will ask must be at the disposal of the individual MP. One means of assuring this information is to have the Provost Marshal prepare overlays for distribution to each traffic post. Such a sketch will be a combination administrative order, circulation map, and station list. Information on it will come from every section. Such an overlay will be kept current by having the officer or non-com making the rounds of posts, check with the staff before commencing his tour. In order to avoid having such a document fall into hostile hands, it will be hidden under a stone or in a hole at the side of the road.

Third: *Use military police where they can render maximum assistance to combat troops.* The whole philosophy behind the employment of military police should be to assist the divisional combat units so that they can concentrate on combat. For example, is a squad of military police employed to control traffic for the movement of a combat team doing a more vital job than the same squad held to provide guides for the movement of the division command post?

Close support means that military police may properly be sent along with a combat team when it is given a mission. It certainly means that MP personnel should visit regimental command posts frequently to see what assistance may be rendered. Many staff officers argue that if military police are sent to a regiment, they will be used for command post guards and similar details. This may be true. But it is true because in the majority of cases the regimental staff has no idea what to do with military police assigned to them. It is to the interest of the entire division for the general staff and the Provost Marshal to carry out an educational program in this respect. Remember, staffs higher than those of regiments have been known to be guilty of impotent use.

Study the organization of your military police unit and work out with the Provost Marshal a scheme for giving each combat team a detail of military police suitable for its needs. Utilize non-coms to the utmost as leaders of these teams.

Before discussing the functions of the military police, it is well to arrive at an understanding of the basic fabric of an MP unit. Every organization has a traffic unit and a police unit. Organizations vary in size according to type organization. The smallest unit is the platoon of the division, the largest the battalion of the Army. Generally, the police section handles prisoners of war and stragglers. The traffic unit mans traffic control headquarters under G-4 and provides for all traffic posts within the area.

TRAFFIC CONTROL.—The most obvious need for military police in combat is for *traffic control.* Has there been one critique at the conclusion of a maneuver at which the subject of traffic jams has not been mentioned?

When mistakes occur in routing, or roads become blocked, it is not uncommon to hear that "it was the fault of that dumb MP at the crossroads," or that it occurred because no MP's were present to direct traffic. Actually, the blame can usually be placed at the feet of the general staff officer who, in making his

plans, failed to ascertain road conditions from the Provost Marshal, or who failed to advise the Provost Marshal of the movement in sufficient time to provide adequate traffic control.

For example, in a recent maneuver it was known to the division staff during daylight hours that a motor movement would be made over a certain road that night. It was not until several hours after dark, when actual orders for the movement had been issued and the commanding general had specifically called attention to the need for traffic control, that any thought was given to informing the Provost Marshal. He was then ordered to post police on a road which he had not reconnoitered. By the time military police had been posted, the movement had taken place. Infantrymen had been used by the regimental commander for traffic control. Is it any wonder that the doughboy officer or enlisted man questions the value of military police? Had a traffic control plan been ready when the movement was ordered, the regimental staff and commander would have been free to center their attention on their combat mission. Many men, pulled out for traffic control, would have been available for the job for which they were trained—fighting.

For movement of a division involving many points of potential traffic conflict, military police may occasionally be posted singly. *Remember that they are not posted as guides but for traffic control.* Within a division area, it is wise and economical to post traffic police in teams of three men. This method has several advantages, mentioned below. The post may be maintained on a twenty-four hour basis without requiring a vehicle to make the rounds to post reliefs which is a time-consuming factor.

On the basis of present equipment, each post may be furnished a quarter-ton vehicle for patrol purposes between adjacent posts to apprehend speeders and blackout violators and assist at accidents or jams. Replacement is always available in case of casualty of the man on post from bombing or interdiction fire. The men not on duty can maintain themselves comfortably in a sheltered position, not far from the post. If the post is near an installation, arrangements can be made to feed them there; if not, C ration can be used.

SIGNAL COMMUNICATIONS.—The lack of organic signal communication within divisional military police units handicaps operations materially. However, it is not the purpose of this article to contend for changes in current tables of organization or basic allowances. The problem of finding sufficient wave lengths for tactical operations is so acute that the war department has determined that within the division no radios will be assigned to military police. This decision should not be interpreted as a directive not to use any signal communication for traffic control. Until such time as radios can be furnished, it is a challenge to the ingenuity of the general staff and to the Provost Marshal and Signal Officer to work out a system for the utilization of the radios and telephones of the signal company and of other units for traffic control. In movements of the division, the majority of radios may be silent. When this situation exists, there can be no valid objection upon the part of lower headquarters to utilizing their sets if assured that they will get them back when the movement is completed. A Provost Marshal who appreciates the importance of traffic control should make every effort to experiment, in conjunction with G-4 and the Signal Officer, to discover a satisfactory solution. It can be done. It will pay dividends in the coordination of movement thereby provided.

ROAD PRIORITIES.—G-3 commonly assigns road priorities to various combat units, such as armored units, tank destroyers, and bridging equipment. G-4 will make similar assignments for supply and evacuation movements. Sometimes they fail to take into consideration the technique of executing such priorities. The drivers of ammunition supply trucks, ambulances, and similar vehicles seldom see the order creating such priorities. Even if they did, it would mean nothing to them. The presence of another unit on the road is simply an extra traffic hazard to them.

Miscellaneous trains impede the rapid progress of priority columns. This is particularly true on narrow and rough roads. For example, in the case of the tank destroyer battalion, G-3 makes advance plans for the utilization of the unit. He does this in order that precious minutes may be saved when an armored threat appears. If those plans are made known to the Provost Marshal, he will study the traffic situation and arrange for the establishment of temporary traffic posts along roads which the TD battalion may use as it rushes forward to joust with the enemy armor. He will maintain close liaison with G-3 so that when the order for movement is given, a control system can be placed in operation. Only by advance planning on the part of the traffic personnel, can the effectiveness of road priorities be assured.

PRISONERS OF WAR.—Military Police operate the Division Prisoner of War Collecting Point to which regiments evacuate prisoners taken. G-1 selects the location upon recommendation of the Provost Marshal and after consultation with G-2. The Field Manual states that the collecting point will be on or near the straggler line. This general principle was adopted so that guards, having delivered prisoners, could return *via* the straggler collecting point, there picking up stragglers for return to their units. There are, however, other considerations which should be taken into account in mobile warfare. Selection will also depend upon the road net and the movement of supply vehicles to the rear. When the number of prisoners is not large, empty supply vehicles present the best means of speedy and economi-

cal evacuation, provided such use does not divert them from their primary task. Captured enemy vehicles may also be used.

Evacuation from the division Prisoner of War Collecting Point is the responsibility of army. When the Army Provost Marshal desires evacuation by vehicles, the division G-1 must coordinate carefully with his own G-4 and Provost Marshal and with the army G-1 to insure that vehicles are not diverted from their primary mission. The "normal" method of evacuation of large numbers of prisoners is by marching.

G-2 may profitably show considerable interest in the training of the prisoner of war detail. By searching and segregating prisoners, assisting in their interrogation, and imposing discipline upon them, the military police can greatly facilitate the job of obtaining information.

An efficient prisoner of war evacuation system supports the tactical operation. It provides another means of reducing friction in the military machine.

STRAGGLING.—General staff officers should understand that the number of military police detailed for straggler duty is not a constant factor. It varies, particularly with the type of operation being conducted. For example, in a steady advance of a fresh unit of high morale, stragglers will consist mainly of personnel lost from their units. Traffic posts can generally handle such individuals. On the other hand, in retrograde movements, the most stringent measures imposed by strong posts and patrols will have to be maintained.

The current doctrine locates the straggler line in rear of the *light* artillery positions. Since there is little difference between the location of the medium and the light artillery of the division, the word *light* need no longer be included.

The conception of a straggler line as a line which remains constant during an operation until the next field order is prepared, is just as erroneous as is the illusion of the "front line" as a line of troops on the ground. As the tide of battle sways to and fro, so must the straggler line advance and withdraw. Therefore, unless the Provost Marshal keeps abreast of the tactical situation he can not determine when movements are necessary, or when posts are to be reinforced.

Another phase of straggling requires mention. Every intentional straggler is a potential looter. Every looter is a straggler. British reports dwell upon the damage done to much valuable equipment by individual soldiers. They enjoin all commanders to use the strictest measures to prevent looting. If, then, looting is prevalent, patrols throughout the area to protect equipment will be of more value than placing all military police on a straggler line.

Straggling robs a unit of its combat efficiency. It is prevented by aggressive action in accordance with the current situation. Its prevention renders close support to the combatant arms.

CIVILIAN CONTROL.—The French debacle of June 1940, when civilians so interfered with military movement that units could not get to the front, is a notable illustration of the need for civilian control in the theater of operations. It may be expected that the Axis will attempt to cause similar panic amongst civilians and to drive them into the path of our advancing armies. Enemy agents will be left behind to pose as natives, carry on sabotage, and furnish information.

When the division occupies an area, G-1 plans for the control of the civilian population. Hostages may be taken and civilians known to be hostile may be placed under arrest. Local political leaders and police officers will be required to bear most of the burden of control, and instructions to the people will be issued through them. In densely populated areas it will be impossible for the division to provide enough troops in each town to prevent movement of civilian population. Therefore it may be found advisable to cover tactically unimportant towns with occasional patrols. In others a few military police may be stationed, and traffic control posts will be issued instructions concerning the handling of civilians.

For use in the event of panic, G-1 should request G-3 to alert some portion of the reserve so that interference with tactical operations may be prevented. The unit chosen will depend, of course, upon the population density and the size of the area for which the division is responsible. When the unit is alerted the commanding officer reports to G-1 for instructions. Generally the Provost Marshal will be given authority over the unit if called out, and he will work out the details for its employment with the unit commander. A reconnaissance of the area is made but the unit is not withdrawn from the reserve unless a contingency arises making it absolutely necessary. Its primary mission continues to be employment in combat.

Control of civilians aids the tactical operations. Military police are primarily responsible for this control. When it becomes necessary to supplement military police with other units, military police should function in a supervisory capacity because of their special training.

* * *

It is only by looking ahead and anticipating what is likely to happen and preparing to meet it that efficient regulation and control can be accomplished. The general staff anticipates the tactical situation and prepares plans for the employment of the military machine. The military police provide the commander and his staff with a means for its efficient regulation and control. It is only by the integration of these two factors that the machine-like precision so vital to victory is attained.

The Silent Partner in the AAF

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SOME of the tactical achievements of the Army Air Forces in the current unpleasantness have been so spectacular and their operations so—to borrow a perfectly good Hollywoodism—glamorous, that relatively few outside the AAF know much about the silent partner in the corporation, the Air Service Command whose proud boast is "We Keep 'Em Flyin'!"

This article will attempt to lift the veil—within the scope of regulations affecting the release of military information.

There are a couple of old, familiar refrains that ring in the ears of every military man—"The impetus of supply should be from rear to front" and "Combat units should not be burdened with the problem of supply and maintenance—all their efforts should be devoted to the one specific purpose of finding, fixing and fighting the enemy." For bombardment aviation this means flying and bombing. For fighter aviation it means flying and fighting. For observation aviation it means flying and finding. But manifestly someone has to think about Gas, Grub, and Gadgets, which is the AAF version of the time-honored "Bread, Beans, and Bullets."

The reader will agree that no arm possesses greater *tactical* mobility than the AAF; and, if he will think a moment, that no arm possesses less *strategical* mobility. The great tonnage of fuel and bombs required for air operations, the relative fragility of equipment such as airplanes and radios, the large volume of repair and maintenance, and the necessity for extensive prepared operational areas—all of these factors add up to a tremendous problem of supply and maintenance for air units which must be considered in strategical planning.

And it must never be forgotten that unless the necessary supplies are all present *at the right time, at the right place,* and *in the right quantity,* the mission is foredoomed to failure. It is perfectly possible for a relatively poor tactical operation to succeed because everything was at hand when needed—but the most perfect tactical plan ever conceived will fail absolutely if the logistical plan supporting it fails. The finest airplanes and pilots in the world are worse than useless unless they can perform their primary mission of flying and fighting. And this they cannot do without adequate supply and maintenance.

To summarize briefly, the logistical functions necessary to support tactical operations are procurement, storage, distribution, maintenance, and training and supplying service personnel. And these in general, applied to AAF matériel, are the functions of the Air Service Command.

AAF Regulation No. 20-4, 17 October 1941, was the authority for establishing the Air Service Command under the Commanding General of the Army Air Forces. The organization of the Air Service Command was to consist of a commanding general with the necessary staff and subordinate agencies, together with the facilities, units, troops, and personnel which had been assigned to the jurisdiction of the Air Corps Maintenance Command. The latter was thereby inactivated.

DUTIES OF COMMANDING GENERAL, AIR SERVICE COMMAND

The Commanding General, Air Service Command, pursuant to policies, directives, and instructions issued by higher authority, is charged with the following duties:

1. Supervision of all activities of the AAF within the continental limits of the United States insofar as they pertain to storage and issue of equipment and supplies procured by the AAF.

2. The maintenance, repair, overhaul, and salvage of all AAF equipment and supplies which are assigned to AAF units beyond the responsibility for first and second echelons of maintenance[1]

3. Preparation and issue of all technical orders and instructions pertinent to aeronautical matériel.

4. Except as otherwise provided, coordination with other supply arms and services of the army relative to storage, issue, maintenance, repair, and salvage of equipment and supplies procured by them for use by the AAF.

5. Computation of AAF requirements for supplies to be procured by the Air Service Command or to be supplied to the AAF by other arms and services.

6. Procurement of equipment and supplies required in the operation of the AAF as may be directed by higher authority. This embraces all aeronautical equipment except the complete airplane, which is procured by the Matériel Command.

7. Command control within the United States of all air depots, subdepots, air depot groups, service groups, and service centers, together with attached service troops.[2]

The Commanding General, Air Service Command, prepares plans for the operation of those elements of the AAF which are under his control; and for improvements thereto. Included in these plans will be adequate provision for extending Air Service Command facilities and service organizations to the combat zone to insure that combat units will at all times be provided with adequate logistical support.

ORGANIZATION OF THE AIR SERVICE COMMAND

The Air Service Command has just recently undergone a rather drastic reorganization. The principal features are the elimination of the four Air Service Area Commands and of the A-staff. This reorganization is effected by General Order No. 142, HQ, Air Service Command, dated 12 December 1942. The reasons behind this reorganization are so important that it may be well to discuss them briefly.

The functions of the Air Service Command, as enumerated earlier in this article, more nearly approach those of a manufacturing, distributing, commercial organization rather than those of a military organization. Consequently the reorganization of the Air Service Command has been along industrial functional lines and away from military line and staff organization. Instead of the military command and staff organization of units, we find (referring to Fig. 1) three great

[1]First echelon maintenance as interpreted by Tech. Order 00-25-4 is any maintenance which can be accomplished with supplies and hand tools carried in the crew chief's kit. Second echelon is that type of maintenance which requires replacement of damaged parts, both for engines and airplanes, when repair or replacement is of a minor nature. Both 1st and 2nd echelon maintenance are the responsibility of the using squadron.

[2]The command control of subdepots hereby assigned to the jurisdiction of the Commanding General, Air Service Command, is limited to that required for the proper functioning of the subdepots. It is not to be construed to alter the prerogatives and responsibilities of the station commander with respect to general administration of the post, camp, or station. The subdepot commander located at a combat or training field receives his instructions relative to supply and maintenance of aircraft at his station from his control depot commander *only*.

main divisions—first, Personnel and Training; second, Supply; and third, Maintenance—together with administrative, control, and special staff elements. This, it will be seen, corresponds rather closely to the industrial concept of organization along the lines of Men, Material, and Machinery.

HQ, Air Service Command, located at Patterson Field, Ohio, is organized as shown in Fig. 1. It will be noted that many of these divisions and sections are the same as in any military organization, and we need not discuss them. However, let's take a look at some of the odd-looking ones.

First, the Control Division. Their job is to make studies and recommendations leading to the establishment of standard policies, practices, and procedure in personnel, maintenance, and supply throughout the Air Service Command. Another function is to collect, interpret, and evaluate information regarding procurement, supply, and maintenance and reduce it to graphic representation for use by Commanding General, Air Service Command, in planning and in formulating policies.

The Budget Officer prepares budget estimates, maintains records of allotments and obligations of funds, and maintains statistical records of stock balances and property accounting. This latter is accomplished by means of duplicate stock record cards maintained at Patterson Field and by a daily inventory as of midnight each day showing the status of AAF supplies and equipment at each of the air depots in the continental U. S. Transmission is by teletype and the punch-card machine-tabulating system is used. This makes possible ready consolidation of information for the budget and procurement sections to act on either by transfer from one depot to another, authorizing local purchase by the air depots, or supplying small lot shipments from a contract already let.

THE AIR DEPOT CONTROL AREAS

The four Air Service Area Commands as authorized by AAF Reg. 20-4A, 27 May 1942, were washed out by the reorganization of the Air Service Command as of 15 December 1942. Functions of command control of the Air Service Command formerly delegated to Air Service Area Commanders are now performed by Control Area Commanders at control depots.[3]

There are now eleven Air Depot Control Areas as shown by Figure 2.

By designation of air depots and subdepots, control areas or air bases, stations, units, detachments, etc., the Commanding General, Air Service Command, places immediate responsibility on a specific air depot or subdepot for the services of maintenance and supply required by each activity of the AAF stationed or temporarily operating within each Air Depot Control Area Command. This program was instituted in an effort further to decentralize operations of the Air Service Command by delegating responsibility for as much local procurement of supplies as the area offered; and to obtain closer personnel and command control and supervision over the air depots, as well as the lower echelons, with the resultant curtailment of teletype, radio, and routine correspondence.

Figure 3 is an approximation of the set-up of an Air Depot Control Area Command. The organization of all Air Depot Control Areas is practically identical. About the only difference is in their geographical size and in the number of AAF installations within their boundaries. Functionally, they are all similar; although, due to the factors mentioned, separate manning tables are necessary for each.

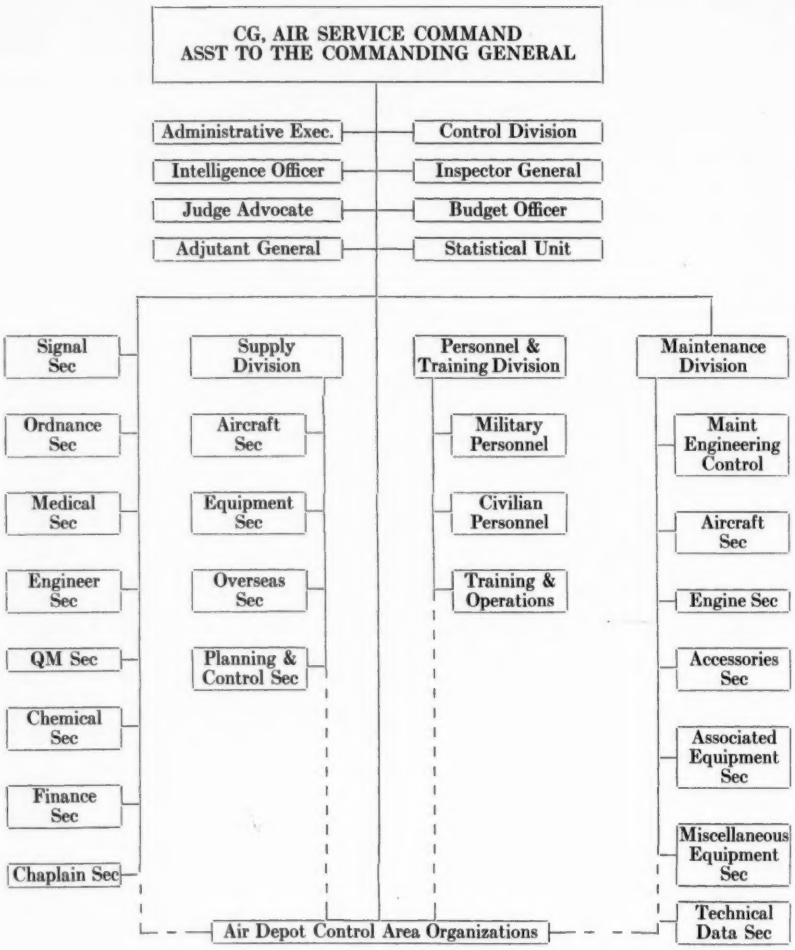

FIGURE 1.

Note that subdepots are assigned to each control depot. The subdepots so assigned are normally located with the control area of each of the depots as designated by the Air Service Command, but there are exceptions, as shown in Figure 2. The subdepot commander operates under control of the Air Depot Control Area Commander on all matters pertaining to supply, engineering, procurement, personnel, etc.

Air Intransit Depots are another activity the Air Depot Control Area directly supervises and controls. The Intransit Depots are located near ports of embarkation (either water or air) and are charged with the responsibility of storing and timing movement of supplies and equipment to arrive at the docks when bottoms or air transports are available at the ports of embarkation for loading.

The Air Depot Control Area also has direct supervision and control of what we may call "Air Dead Storage Depots." The function of this activity is twofold. In the first place, it

[3] "Air depots" and "control depots" as used in this article are synonymous.

makes for smoother operation of the Intransit Depots, which are generally overcrowded, both for floor space and trackage, by acting as a holding point. Thus these "Dead Storage" Depots help relieve congestion at the Intransit Depots as well as at the Port of Embarkation. Their second function is to store in bulk matèriel received from contractors but not needed in control depot stocks at the moment.

The Air Depot Control Area also supervises the letting of contracts with commercial aircraft and engine overhaul contractors for the overhaul of primary training airplanes and engines. Particular attention is paid to the contractor's floor space, tooling, trained mechanics, accounting methods, and overhaul methods. The Air Service Command furnishes all

FIGURE 2.

spares necessary for the overhauls and these are issued to the contractor in accordance with existing circulars and regulations. In addition, the Air Depot Control Area has its representatives at the plants to inspect incoming equipment for disposition, as well as for the compliance of the contractor with technical orders as published by the Air Service Command for the overhaul of airplanes, engines, and equipment.

AIR DEPOT

So much for the Air Depot Control Area. Now let's take a look at the functions inside an AAF depot. Certain of its activities will be dealt with in detail.

Personnel and Training. Civilian training has expanded in the same proportion as the air depots. Its function is to supervise instruction of civilian personnel in the qualifications that are needed at the depots and subdepots. While functions of the Training Officer are primarily out-service training and classification after the student has obtained proficiency in his particular specialty, the training unit follows through up to the time the individuals are employed as temporary Civil Service employes of the depot.

The procedure in the training program is interesting and may be briefly outlined as it exists in a typical case. Eleven training colleges and high schools in the vicinity of this particular air depot, with the required equipment to conduct classes for the vocational training pertinent to the needs of the Supply and Maintenance Departments of the Depot, are engaged in what is referred to as the out-service training. This involves thousands of students. Instructor personnel is furnished from qualified personnel of the depot where required. The courses given are in the main theoretical, with a very limited amount of practical instruction.

When the student has obtained the required proficiency he or she is graduated and is then eligible to receive in-service training, and may, if so desired, be employed as a temporary Civil Service employee in the grade of General Helper ($1,320 per annum) in the Engineering (or Maintenance) Department, or as a CAF-1, or General Helper ($1,260 per annum) in the Supply Department of the depot. The first two to four weeks after the employees report for duty at the depot, they are given instruction in the Depot Training School Center, covering Civil Service requirements—customs and what will be expected of them, the handling of and familiarization with tools, and related subjects. At the conclusion of that period they continue their training in the Industrial Area (Supply and Engineering Departments) where they actually perform the duties of regular employes under the immediate supervision of what is referred to as a "lead man." If the employee student's services are satisfactory, as reported by the lead man through the foreman of the section the student is working in, he or she is promoted to the classification specialized in, and ceases to be a learner and carries on as a full fledged employee.

This extensive training program was required and fortunately was well under way some months prior to De-

cember 7, 1941. It was necessitated by the lack of trained, skilled aviation mechanics and supply personnel to conduct the expanded requirements placed on the depot by the tremendous expansion of the AAF.

As an illustration, one air depot had in the vicinity of 150 employees in the Supply Department and 800 in the Engineering Department just about 2½ years ago, and by last June had increased its employees to 2,500-odd in the Supply Department and 10,000-odd in the Engineering Department.

AIR DEPOT CONTROL AREA

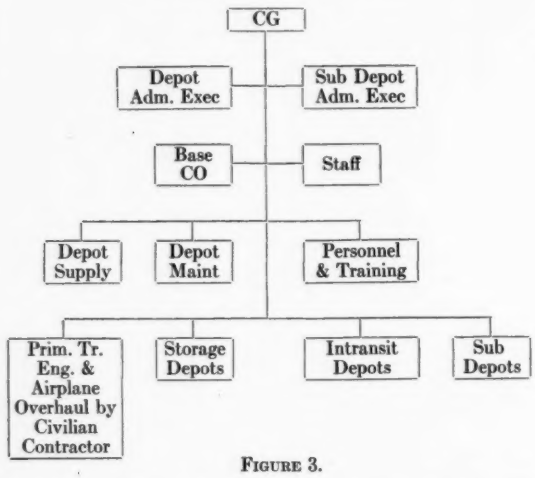

FIGURE 3.

with a corresponding amount of increased production. You will realize therefore that the fully rounded-out aviation mechanic or supply man is a thing of the past, and the specialized employee came into being in the depot. Time did not permit of other than specialized training, straight-line production, and such.

The reader may wonder at the amount of time devoted to civilian employees. Of the many thousands of workers in Air Service Command, the great majority of the personnel are civilians, of whom 60% are women. Considerable use is also made of civilian personnel in Base Air Depots in certain of the overseas Theaters of Operations.

Depot Supply. The five main subdivisions of the Depot Supply, consist of: Administration, Warehouse, Inspection, Inventory, and Purchasing and Contracting.

1. The Administrative subdivision contains a Personnel Section, Requisition Section, Memo Receipt Section, a Stock Record Department operating in excess of 125,000 stock record cards, and a Work Order section.

2. Included in the Warehouse Section is the shipping and receiving section, having to do with all types of shipment—rail, commercial van, depot van, combat and training trucks, as well as air shipment and the movement of equipment and supplies for water shipment. A packing and crating section is also included.

3. Then comes the Inspection Section. All supplies and equipment, other than original containers bearing an Army Inspector's seal, are inspected, both incoming and outgoing. In this section one would find all drawings, blue prints, technical orders, stock lists, and parts catalogues necessary to the inspection function.

4. Next is the Inventory Section. This section is required to inventory, by the running inventory method, all stock in the Depot Supply proper as well as in the technical supply. The inventory covers a one-year period.

5. And lastly, the Purchasing and Contracting Section. This is a highly technical unit, involving the expenditure of many millions of dollars annually to cover contracts negotiated locally and local purchase as authorized by higher authority and instructions contained in stock lists. Care is exercised that any procurement made, if included in the General Schedule of Supplies, is purchased at the listed price and at one of the listed dealers or agencies. Where no definite instructions appear in the stock list, local purchases should be confined to standard recoverable and expendable items.

Depot Maintenance. The Engineering Department or, as it is now called, Maintenance Division, is composed of seven main sections.

1. The Administration Section includes the usual engineering clerical staff and technical file unit.

2. The Planning Section is a very important unit. Its main duty, as its name implies, is to plan and to obtain the necessary information so that engines, aircraft, propellers, instruments, etc., will not be held up on the production line due to parts shortages, lack of personnel, equipment being used for other work already undergoing overhaul or repair, available floor space, priorities, or other bottlenecks. With the Maintenance Division operating as it is under a production line system, in so far as is possible all types of equipment are worked on at the same time. With the many types of engines and airplanes from the puddle jumper to the Flying Fortress that are being overhauled at a depot, this service production line policy puts a real load on the Planning Section. This section works very closely with the Supply Department, keeping that department informed of anticipated parts, materials, and tools the Maintenance Division will need, in addition to the stock level maintained in the supply. It also works directly with the Supply Department with relation to Work Orders, both routine and emergency.

3. The Project Section. This unit has set up skilled mechanics and helpers assigned in groups or teams, with a thorough knowledge of a particular type of equipment. These teams are assigned to projects as the equipment arrives at the depot for repair, inspection, or new installations. When no project is being progressed through the depot requiring that particular group's knowledge, the individuals remain at, and conduct, their regularly assigned duty.

4. Cost Accounting. A record is maintained of the cost of the repair or overhaul of each engine and airplane, including labor and supplies, as well as the cost of repairing parts and equipment fabricated for the Industrial Area, or other depot departments.

5. Plant Maintenance. This unit constructs special benches, racks, and any equipment needed in the Supply or Maintenance Divisions for the department's proper functioning. In addition it makes repairs on cranes, machinery, and equipment operating within the plant. One could refer to this section as an all-around handy-man department.

6. The Parachute Section packs, inspects, drop tests, repairs, and repacks all parachutes within its depot control area.

7. The Engine Overhaul Section is broken down into specialized units. One handles carburetors, fuel pumps, and other equipment of the fuel and lubricating system. Another handles electrical equipment such as magnetos, generators, starters, and spark plugs.

Inspection is made at time of tear-down, condemning parts, recommending repair of parts or survey as the situation dictates. All parts are cleaned after tear-down and inspected again, and placed in individual engine racks. Then if the necessary replacement parts are available the engine proceeds through the production line for necessary work such as cylinder grinding, lapping, honing, bearing scraping, and other operations. Upon the engine's arrival at the final assembly section all the engine parts in the rack are assembled into a complete engine and put on the test stand

for the necessary number of run-up hours at the different RPM's specified in that particular engine's technical order. The Machine Shop is equipped with all types of machine shop equipment for the manufacturing of parts, including engine, aircraft, accessories, and sheet metal, or skin work, including wood and fabric.

Airplane Overhaul and Repair involves the tear-down, or disassembly, and inspection of airfoils, struts, and a hundred and one other parts. Instruments are inspected, overhauled, and repaired in the Instrument Section and returned to the aircraft production line for installation in the final Assembly Section of the Airplane Overhaul and Repair Section. After the assembly of the airplane, inspectors go over the plane completely and indicate by their initials on the many inspection points that it has been inspected and by whom.

The airplane, now completely assembled with engine and instruments installed, is moved to the Final Inspection dock where it is again gone over from nose to tail, inside and out, and the final OK given by that section, thereby making it ready for flight. The aircraft is then turned over to the Flight Test Section for a thorough flight test, involving all maneuvers that the aircraft is capable of doing as set up in the technical order of that particular airplane and engine.

At the conclusion of the flight test, if satisfactory, the airplane is turned over to the Supply Department for equipping the craft with its tools, etc., which were removed prior to the craft's being turned over to the Maintenance Division for overhaul. The next step is to inform the unit to which the aircraft has been assigned that it is ready for delivery. Upon arrival of the ferry crew a hand receipt for the airplane, complete with accessories, is signed by the ferry pilot and a shipping ticket forwarded to the subdepot commander of the field to which the airplane has been assigned for accomplishment and return to the depot. It should be mentioned that when equipment is sent to the depot for repair or overhaul, the accountability is transferred to the depot. Upon completion of the work the equipment is then shipped to the receiving AAF unit on shipping ticket.

Subdepot

The subdepot has the same general organization as the Control Depot except on a smaller scale, and it is not charged with the fourth echelon of maintenance but only with the third. The subdepot is an installation which is designed to operate the supply and engineering (or maintenance) activities of an AAF station. It operates directly under the control of the Control Depot to which it is assigned.

The subdepot is organized with commissioned officers in charge and with such number of civilian employees as are necessary to operate the activity. The size of each subdepot will therefore vary with the nature and extent of the AAF activities at the station.

The ranking officer assigned to a subdepot will be designated Subdepot Commander thereof. He will act as liaison officer between the Control Depot Commander and the commanding officer of the base at which he is stationed. In addition, he may or may not be the supply officer himself or the engineering officer himself; however, when available, at least three officers should be assigned to each subdepot.

The Supply Department of the subdepot will conduct all AAF supply operations and maintain the accountable records of the station. It will receive all incoming shipments and will make available supplies for distribution to all AAF unit supply officers. The Maintenance Division of a subdepot will perform all third echelon maintenance of aircraft, AAF equipment, and supplies. The extent of the operational control of the Engineering Department in third echelon of maintenance will be as directed by the Control Area Commander.

The Air Service Command Overseas

Now let's take a quick look at the Air Service Command in an overseas Theater of Operations.

In general, the functions are the same as those previously discussed for the Air Service Command in the United States, except that they are performed by military personnel instead of civilian. Also, the Air Service Command units in a Theater of Operations come directly under the command of the Air Force Commander, and he can modify their operations and employment as may be required by the situation. This authority (for changing the plan of operation) is expressly delegated by AAF Regulation 65-1, 14 August 1942, par. 1, which states, "It is recognized that in some theaters, due to local conditions, air force commanders will find it advisable to make some deviations from the plan prescribed in order to obtain best results. This is a command function."

The Air Service Command in the United States is responsible for activating, organizing, training, equipping, and supplying to overseas Air Force commanders these AAF service units: Air Depot Group; Service Group; Quartermaster Co., Service Group (Avn); Quartermaster Co., Truck (Avn); Ordnance Co., Medical Maintenance (Q) (Avn); Ordnance Co., Service Group (Avn); Signal Co., Service Group (Avn); and Chemical Co., Air Operations (Avn). Together with these, there are several other service organizations required for the operation and services of an Air Force Service Command, Air Task Force, Air Depot, and Air Service Center.

In general, the training of these units is combined and concurrent. Wherever possible—and especially in the final training phases (third phase of OTU)—this training should be carried out in conjunction with the specific combat units which the service units are to support in a theater of operations. The purpose of this combined training is of course to produce a trained team, fully cognizant of each other's capabilities and limitations, knowing each other, and used to working together. The advantages to be gained from this type of training should be obvious.

Conclusion

It is hoped that the reader will realize from the foregoing that the Air Service Command is a large organization, composed of highly technical units; and that the forecasting and planning for the supply and maintenance of aircraft, each of which is composed of thousands of parts the failure of nearly any one of which will ground the airplane, is a real undertaking and requires the closest of coordination between Air Service Command echelons as well as with the Training and Combat Commands. It is evident that the Air Service Command has quite a job to do to fulfill its boast, "We keep 'em flyin'!"

Application of Air Transport to Problems of Supply

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THE NEAREST approach to a perfect representation of the American eagle is an American airplane whether it be a Piper Cub or the giant Mars flying boat. Air transport, however, is so young that it is comparable to a young eagle: it has broken its shell but it has not yet lifted itself to the heights where it is destined to soar as the monarch of the skies.

There are many things to be said on both sides of any discussion concerning air transportation. Enthusiasm for this means of rapid communication should not lead one to go off the deep end and join the relatively few who contend that the movement of all personnel and all commodities should be by air.[1] On the other hand, the point of view which places air transportation in the limited classification of passenger carrier de luxe, with no practical application to the handling of cargo, should likewise be treated with reserve.

Unlike the locomotive or the steamship, the airplane was first put to large-scale use, not in peace, but in war. It was not until after the airplane had attained importance as an instrument of reconnaissance and destruction in World War I that serious development of its possibilities in peaceful traffic began. Today military usefulness is again the dominant factor in the progress of air transport.[2]

Prior to World War I there had been only a few attempts, of an experimental character, to use aircraft for transportation, the most noteworthy of which was a series of flights in 1911-13 in Germany by Zeppelin airships, and, in the United States, a service between St. Petersburg and Tampa, Florida, for three months in 1914. Suggestions that aircraft could be used to special advantage for the carriage of mails were made quite early but the first regular air-mail service was started in the spring of 1918 between New York and Washington, initially with Army planes and pilots. About the same time, regularly scheduled air transportation was attempted in Germany, Italy, and Austria-Hungary, and plans were made for post-war international services in Europe.

The first World War not only stimulated the technical development of aeronautics: it increased immensely the productive capacity of the aircraft manufacturing industry and led to the training of large numbers of personnel and an increase in the number of airfields, especially in Europe.

The Treaty of Versailles itself influenced post-war developments of air transport. For, by depriving Germany temporarily of military aviation, it turned German efforts toward the development of civil air transport; civil aviation then became the only means of maintaining the existence of the aircraft manufacturing industry in Germany. In many remote countries Germans at once started developing air lines and importing Junkers planes.

Domestic air transport is of greater relative importance in the United States, the Soviet Union, Brazil, and the British Empire as a whole than it is in the states of western Europe which have concentrated on the development of international and colonial air services. With respect to the four countries just mentioned the following figures indicate the relationship of regularly established air-route miles to areas and populations:

Country	*Area Sq Mi (millions)*	*Population (millions)*	*Air Miles*	*R/Area*	*R/Pop*
United States	3.0	131.7	72,632	42	1,820
Brazil	3.3	44.1	9,182	352	4,820
U. S. S. R.	8.8	192.7	65,865	134	2,920
British Empire	13.6	504.7	89,077	154	5,650
Japanese Empire	.26	105.2	8,694	30	12,100

The significance of these comparisons is obvious. The ratio of air-route miles to area is comparable with the number of strings you wrap around a package to hold it together. The ratio of air-route miles to population indicates the average size of the group of persons served by one air-route mile. The former is of political importance, the latter of economic importance.

Perhaps the reader's thoughts are pointing to the question: Why talk about pre-World War II international air routes?—most of them do not exist at the present time. To that extent, the thought is correct. However, if one were given the responsibility of designing and developing new supply routes, geared to the tempo of modern warfare, would he just pick up a map of the world and start right in without a moment's consideration of the routes men have traveled before him? Of course, the answer is in the negative. A survey of all international air transport routes, as of the latest available date, will establish

[1] *The Airplane in the Scheme of Post War Transportation* by W. A. Patterson.

[2] *International Air Transport and National Policy* by Lissitzyn.

those routes over which men have accumulated actual experience including the locations at which air transport facilities have been established.

The great importance of air routes was emphasized by the fact that rapidly growing international tension, even before September 1939, had led to the suspension of many air services in Europe. The fortunes of war made air routes on the perimeter of Axis-dominated Europe (England, Lisbon, and trans-Africa) of vital importance to the Allied cause. The years 1939 and 1940 marked the turning point in the history of world air transport as well as in world history in general.

Our attention next focuses on the extent of our Domestic Air Transport Service at the beginning of our participation in World War II. The exact number of planes in commercial service has never been announced; but we do know from ⅓ to ½ of all the planes regularly assigned to commercial service were withdrawn therefrom and impressed into government service under the direction of the Air Transport Command. The effect of this relocation of domestic aircraft may be misunderstood, so we give you a few figures to indicate the net result of this reallocation:

AIRLINES' RECORD

	1941	1942	Per cent Change
Revenue passenger miles	1,491,734,671	1,700,577,524	Plus 14
Passengers carried	4,060,545	4,446,297	Plus 9.5
Miles flown	133,022,697	126,200,000	Minus 5
Seat miles flown	2,316,205,507	2,230,000,000	Minus 3.76
Express poundage	19,209,671	40,340,319	Plus 110

Statistics for a recent ten-weeks' period establish the fact that the Air Command is handling an average of more than one million pounds per week over routes entirely within the continental United States. The value of this expedited service to the war effort cannot be measured.

On the basis of the relationship of commercially established air routes to war-dictated air lanes within the United States, one would expect the routes of our Air Transport Command which reach beyond continental limits to follow those established by our own and other nations in the development of international air service.

Our global air routes may roughly be divided into four groups:

1. South Atlantic-Trans African Route.
2. Alaskan Route.
3. South Pacific Route.
4. North Atlantic Route.

Statistics mean little until they are illustrated. During the early spring of 1942 we were extremely worried about the supply of block mica which is used in aircraft magneto insulation and as insulation in spark plugs and radio tubes. Very little block mica is produced in the United States and the supply must be imported. Requirements had multiplied due to the demands of the war effort, but ocean shipping from India was too slow (two or two and one-half months) and was becoming far too dangerous. Early in March 1942, WPB received information from the Army Air Transport Command that on their new operations into India, there would be space on the return flights for cargo, and they requested a list of strategic materials in order of priority which should be carried on the planes. WPB submitted to them a list of requirements in order of priority, and since that time block mica has been flown all the way from India to this country and has prevented shutdowns of our radio and spark plug factories.

Some time ago radio manufacturers of this country were facing a desperate shortage of quartz crystals from which they manufacture radio oscillators. Not only had ships from Rio been delayed for months due to the submarine menace, but also many of those ships which had sailed for the United States, several of them with large cargoes of quartz crystals, had been sunk.

WPB transmitted to the Joint Air Transport Committee of the Army and Navy its total requirements for imports from Brazil of mica, quartz crystals, tantalite, beryl, and other strategic materials which we could not afford to lose at sea, and for which the demand was so urgent that prompt delivery was necessary.

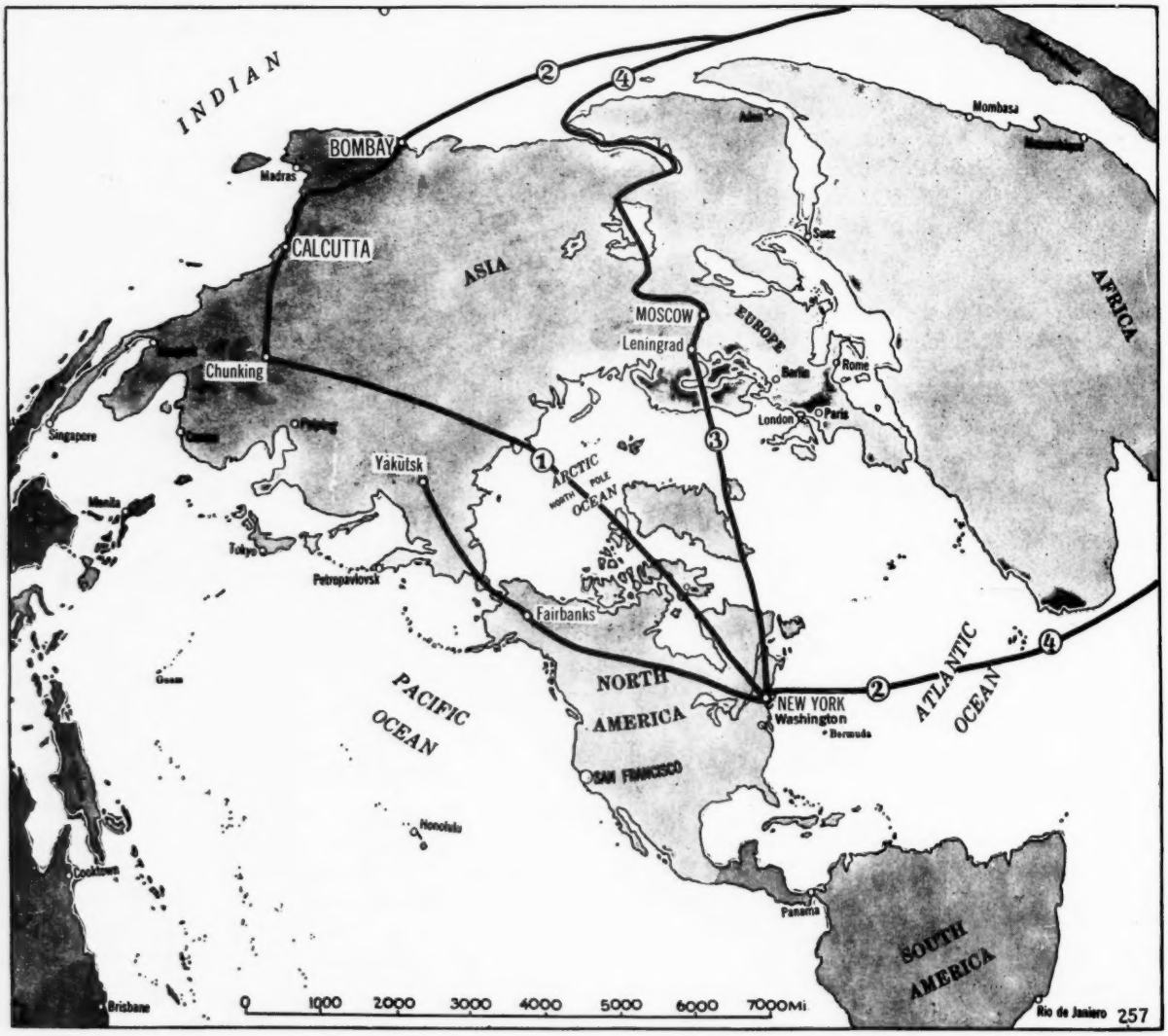
At that time there was only one passenger plane a day from Rio to the United States, which plane was almost entirely filled with passengers every day and on which there was almost no space for the large requirements which WPB specified for imports of cargo.

The Joint Army-Navy Air Transport Committee, therefore, allocated planes and put in operation a special shuttle service of Army and Navy planes to bring these materials from Brazil to the United States. This service has literally kept our radio production in the United States going.

A further benefit derived from services along this route is political rather than economic in nature. The advent of our entry into World War II necessitated our withdrawal from the South American service of practically all American flag shipping. This strained our Good-Neighbor relations to a critical point. The appearance of aircraft of the American Air Transport Command in the countries "south of the border" might be compared to Noah's reception of the Dove when it returned with the olive branch. These planes carried back to the United States only the highest value-per-pound commodities including mica, quartz crystals, industrial diamonds, tantalite, beryl, rubber, and tungsten ore. The value of these

movements from an economic point of view is obvious. We can only suggest the value of these services from a political point of view.

It would seem unnecessary to indicate any specific illustration of the distinguished services provided by air transport to Alaska. Ever since Floyd Bennett flew his life-saving serum to Nome, Alaska has been linked to the States by countless numbers of aircraft of all types and descriptions, using landing fields of



speed and range—also restrict the operation of current type planes to routes which include landing fields and fueling stations. Today is bringing forth a new airplane which will provide truly global service without the restrictions imposed by the handicaps of current types of airplanes.

Douglas Aircraft has done much valuable research on the possibilities of trans-polar air routes as illustrated on the accompanying chart. These routes are

every kind, and flying more often on unscheduled and uncharted routes than otherwise.

This brings us to a consideration of the further application of air transport to problems of supply. In this connection, one can do no better than repeat the words of Rudyard Kipling: "We are at the opening verse of the opening page of the chapter of endless possibilities."

In the earlier part of this discussion it was suggested that it was only natural that supply routes via air should follow the trails blazed by commercial air lines as nations sought to tie empires more closely together. Characteristics of aircraft—that is, air radical but not to the extent of being founded on impossible ground support. They are still confined within the present critical range of aircraft which is 2500 miles. Those which reach across the Arctic and transverse Russia must await the day when war is no more, or when hostilities are declared between Russia and Japan.

The Douglas chart reveals a previously unexplored service which ordinarily is not attributed to air transport. We usually measure the utility of air transport in terms of time saved by reason of its superior speed. However, the airplane also can produce tremendous savings in actual miles, in addition, of course, to time,

by reason of its speed. On the chart, note that Route No. 1, New York to Chungking, aggregates 7,615 miles, whereas Route No. 2, New York to Chungking via Cape Town, involves 16,120 miles. Also note that the distance via Air Route No. 3 from New York to Moscow is 4,640 miles whereas the same two points are separated by 16,600 miles when a shipment is obliged to travel Route No. 4 via Cape Town, the Persian Gulf, the Iranian and Russian railroads to Moscow.

In passing, we might indicate some of the accomplishments of our enemies along these lines.

The application of air transport to supply has been made to the greatest degree by the Germans. With hundreds of Junkers 52's, the Nazis took Rotterdam, held Narvik, and overwhelmed Crete. That type of plane is able to get in and out of poor fields with a minimum of difficulty. It can carry twenty men or two and one-half tons of equipment three hundred miles at 170 miles per hour. With two gliders in tow, each with a ton of stores or ten men and another ton in its own fuselage, it can cover five hundred miles in five hours. With her almost undisputed air power, Germany created her own strategic situations in Norway, Crete, and Libya. Last winter she delivered supplies from the air to her Sixteenth Army which had been encircled at Staraya Russa. The Nazis have developed an effective method for transporting tanks in planes. Turrets and guns are handled in one plane, hulls in another, tracks and remaining equipment in a third.

The outstanding aerial achievement of the opening phase of the Allied African Campaign was the 1,500-mile, non-stop mass flight of 44 Douglas Skytrooper Transports from England to an airdrome near Tunis. The mission of landing paratroops was completed successfully and not an airplane was lost. No other paratroop attack in history has been made over more than a small fraction of the distance!

A striking force at 300 miles per hour cannot successfully be supported by a supply line which moves at 8 knots. Amplification is unnecessary when we compare the striking force of P-38's and B-17's with Liberty ships and foreign railways of various gauges. The average time required by a crossing from our North Atlantic ports to England is between 10 and 14 days. Since the American Export Airlines' first scheduled flight to Europe, May 26, 1942, 3 Vought-Sikorsky flying boats have made more than 100 Atlantic crossings and in the first six months of actual operations eclipsed every known record for transatlantic commercial aircraft, east-bound, west-bound, and non-stop. Fastest single crossing, eastbound from New York to Foynes, was 16 hours, 8 minutes, with 16 passengers, crew of 11, and cargo and mail. This is startling when compared to Howard Hughes' record-breaking 16½-hour trip across the Atlantic a few years ago on his 3½-day round-the-world flight. A record westbound flight was completed in 19 hours, 54 minutes flying time against prevailing head winds, with passengers, cargo and mail.

The average convoy to Australia consumes 30 days (one way) whereas regularly scheduled air service negotiates the same distance in 4 days. Our present all-water route around the Cape of Good Hope to India requires 60 convoy days. Dependable air service is being operated on the basis of 5 to 7 days. Since the Mediterranean is closed to us, Cairo and Basra are at least 75 days away from our east coast. The Air Transport Command can provide service to both of these cities on the basis of from 3½ to 4½ days.

In connection with both rail and motor transportation, it is customary to design and produce special types of equipment to meet special shipping requirements. The re-tooling of an automobile manufacturing plant is a major undertaking, but it is now accomplished with mimimum delay because basic principles of manufacturing have been established. A similar situation exists with reference to the development of special types of freight-carrying rail vehicles. We do not enjoy the same freedom in the development of new types of aircraft. In taking stock of what has been accomplished and what has been learned about the transport of troops and cargo by air during the first year of this war, it must be remembered that we have no experience except with converted airplanes which were not originally designed as cargo or troop carriers. When the need for air transport became desperate, we reached out to the commercial air lines, took their equipment as it was, possibly installed heavier floors, removed the de luxe interiors, loaded them with critical freight, and took off for destinations never dreamed of by the designers of the aircraft itself.

New types of planes are coming from production lines at the present time, and more will come rolling out onto the airfields of the world within the next few months—all of which are specifically designed for the efficient handling of cargo. How should an airplane be measured with respect to the problem of supply? Three possible measurements are: (1) load-carrying capacity per unit of strategic materials employed in manufacture; (2) ratio of load-carrying capacity to fuel capacity and consumption; (3) the type of plane in relation to the job to be done.

Further analyzing the last mentioned measurement, we must consider: (1) the distance to be covered; (2) the load to be carried—troops, airborne or paratroops; or cargo, type, packaging, loading, and stowing; (3) the speed desired; (4) ground facilities at origin, en route, and at destination, including fuel bunker stations, take off and landing characteristics, and available maintenance facilities.

The layman characteristically thinks of the capacity of a given airplane in erroneous terms. Ordinarily we say that an airplane will carry so much, so far, at a certain speed; and almost without exception we described the ship in maximum terms with

respect to each of these three measurements—and thereby we fall into error. In describing one of our prospective air cargo transports we might say it will carry 80,000 pounds pay load, it has a range of 6,000 miles, and an average speed of 210 miles per hour. Wonderful though this airplane may be, it doesn't accomplish all three of these things simultaneously. The truth is, it will carry 80,000 pounds for 3,000 miles, but if the distance to be carried is 7,500 miles the maximum pay load is reduced 75 per cent or to 20,000 pounds. Full speed is dependent upon either economy in fuel consumption or upon emergency where utmost speed justifies any expense.

The freight-carrying characteristics of a plane are described in terms of: (1) size and shape of cargo compartment; (2) horsepower of the power plant; (3) fuel capacity.

We cannot afford to overlook the importance of applying the various types of air transports to the jobs for which they were designed any more than we can permit a square staff officer to be placed in a round staff officer's job. In emergencies any aircraft may be utilized for any job within its operating capacity, but, along lines of supply, air transport should be applied from the point of view of the service for which it was designed.

And finally, a brief summary of the types of aircraft now in service or production. The type most familiar is the Douglas DC-3, a 21-passenger plane operated by commercial air lines. When these ships were commandeered by the Air Transport Command, they put on their war paint and assumed the undignified designation of C-47 when employed as a cargo carrier, and N-53 when used primarily as a personnel carrier. The Curtiss Commando, C-46, is one of the most effective cargo carriers in service today. It is a high-weight, medium-distance cargo plane, whereas the C-54 carries substantially the same amount of cargo but has a range which can be stretched to twice the distance accomplished by the C-46. The C-54 also is designed to handle more easily heavier individual pieces of equipment since it has a hoist which lifts its cargo vertically up to the side loading door.

Curtiss has now in mass production its model C-76, known as the Caravan. This ship is constructed entirely of interchangeable sections built of plywood with a negligible amount of strategic materials. It carries a useful load of approximately 7 tons with a maximum range of more than 3,000 miles.

Douglas has announced the production of a long-range combat transport designed to lift a gross weight of 70 tons and to carry a useful load of 36 tons. Consolidated has modified the design of its B-24 Liberator to develop the C-87 cargo transport. At the present time, WPB has allotted materials sufficient only for the construction of a limited number of these ships per month.

Finally, we look to Lockheed for the type C-60, which is a modification of the very successful Lodestar. Early in February Lockheed's C-69 was successfully flight-tested, when it was discovered that this ship would carry between 15 and 20 tons pay load at speeds greater than accomplished by enemy fighters.

It has been stated already that a striking force of three hundred miles per hour could not be supported by a supply line moving at eight knots. Above all other considerations, war must be kept as far from the continental United States as possible. To this end we as a nation are bending every effort to supply existing battle fronts so effectively that it will not be necessary to defend our homes and country within our own boundaries. Distance, therefore, is basic to our deepest desires and most profound strategy. The effectiveness of distance, however, will be determined solely by the speed of our supply lines. The introduction of speed as an essential element to a supply line makes Army Service Forces a competitor with combat forces who depend on the same elements of air transport to accomplish their tactical missions. In almost any maneuver it is patent that tactical ground forces must be supported by air forces, but who has ever heard of the necessity for a supply line to be supported by an adequate air transport? This thought, however, must pervade all thinking to the extent that those responsible for the successful delivery of supplies to the combat forces will automatically measure the effectiveness of their efforts by the same terms of time and space as those used by the striking forces.

A few campaigns thoroughly studied will do more to strengthen the intellect, to develop a capacity for hard thinking, and to teach the art of leading troops, than fifty campaigns that have been merely skimmed.

Colonel G. F. R. Henderson.

Reinforcing Artillery Employed in Mass

The Attack of an Organized Position

[Prepared for the Military Review at the Field Artillery School, Fort Sill, Oklahoma.]

This is the second article from the original text, the first section of which appeared in the May number of the Military Review *under the title: "The Employment of Corps Artillery." —EDITOR.*

GENERAL.—*a.* The term *reinforcing artillery* applies to such additional artillery as may be attached from a higher unit to a lower. Examples:

1. Artillery units attached by corps to divisions.

2. Large quantities of artillery that are attached to a command as required for a particular operation. Such attachments are especially indicated in the attack of a strong defensive position; the following paragraphs refer exclusively to this type of situation.

b. Commanders of reinforcing units must be aggressive in starting reconnaissance and in utilizing their own means for securing missions and battlefield intelligence. The more rapid the action, the less the aid which may be expected from units already committed.

Considerations Involved in Attaching Large Amounts of Reinforcing Artillery.—When large quantities of reinforcing artillery are to be attached to a command, several complex problems arise. Among these are:

a. The requirements in weapons, additional headquarters, and ammunition.

b. The time and space factors that will control the movement of the units and ammunition to their respective areas of employment.

c. Tentative allocations to subordinate echelons, based on the estimated requirements.

d. Final allocations to subordinate echelons, based upon the reinforcing artillery and ammunition actually allocated by higher headquarters.

e. Determination of the priorities of arrival and of occupation of position by the reinforcing units.

f. Preparatory work to be done, by units now in position, to assist reinforcing units in getting ready to fire.

g. Arrangements for receiving and maneuvering the reinforcing units upon their arrival in the combat zone.

h. Coordination of all field artillery observation means.

i. Release of the reinforcing units at the time designated by the higher headquarters.

These matters are discussed separately in the paragraphs immediately following.

Requirements in Weapons, Headquarters, Ammunitions.—A correct determination of the requirements in weapons, additional headquarters, and ammunition for the support of a particular operation is arrived at through careful calculations made by the artillery commander and staff of the senior echelon present. The commander considers, first, the plan of attack; second, the general and special missions that must be accomplished. The special missions include specific missions ordered by the commander, counterbattery, and missions that require super-power artillery. The calculations for the ammunition requirements must be made concurrently with the requirements for the weapons and the additional headquarters.

Time and Space Considerations.—When the estimated requirements are determined the artillery commander, in cooperation with the general staff, then determines whether the available time, and the road and railroad nets available to bring the reinforcing units and their ammunition into the area will permit completion of the movements. A careful study of the transportation for ammunition purposes that can be made available from units now present is a pertinent consideration.

Tentative Allocations to Subordinate Echelons.—The calculations being completed, the artillery commander makes a tentative organization for combat, based upon his estimates, in order to determine the allocations to subordinate echelons. His estimate provides for the retention under his immediate control of the minimum amount required to accomplish the missions envisaged. The remainder of the reinforcing artillery requested is tentatively allocated to the several subordinate echelons. In making the allocations to subordinate echelons the factors to be considered are: the fire-power needs of these units to accomplish their missions; the particular unit's ability to command additional artillery; position areas available; and routes of access. The subject of organization for combat is presented in a separate text.

Final Allocation to Subordinate Echelons.—When higher headquarters announces the amount of reinforcing artillery and ammunition that will actually be made available, the artillery commander and his staff revise the tentative allocations and plan, with the general staff, the movement of the reinforcing units to the combat zone.

Order of Arrival.—The order of arrival of reinforcing units is basically dependent upon the cover and concealment available at or near position areas. It may also be affected by the prospective employment of certain units. The order of arrival is normally scheduled according to the following priorities:

a. Those batteries or battalions that can go directly to their battle (alternate) positions owing to the fact that cover and concealment are available.

b. Those batteries or battalions that can go to areas affording concealment in the vicinity of their battle or alternate position.

c. Those batteries or battalions that must be brought in as late as possible owing to lack of cover and concealment, either at their positions or in the vicinity thereof. This group must be reduced to the absolute minimum. Careful planning and the cooperation of all commanders and staffs are essential.

Assistance Rendered by Units in Position.—Specific units now in position are directed to make maximum preparations for specific reinforcing units. This assistance may include selection of positions and observation posts; establishment of wire communication; survey; preparation of firing data; and, when practicable, the transportation of ammunition. Such preparatory work must be done intelligently and thoroughly and requires responsible supervision. Commanders of incoming units are responsible that they or their representatives arrive on the ground and start supervision at the earliest possible moment.

Arrangements for Receiving Units.—Arrangements are made to receive the units upon their arrival. These arrangements must be complete and detailed. Among matters to be covered are the following:

a. Arrangements for quartering and feeding advance detachments.

b. Selection of staging areas.

c. Determination of the routes of advance to final positions.

d. Determination of dates and times for the occupation of positions.

e. Information for the incoming units, to include locations of gun positions, observation posts, and command posts, names of local commanders with whom they will deal, codes to be employed, radio frequencies to be employed, wire communication already established, wire communication to be established by the incoming unit, locations of local ammunition dumps, amounts and types of ammunition available to the individual units (this data should include the lot numbers), preparation of firing charts, and local orders covering the requisition and receipt of all classes of supplies.

Coordination of All Field Artillery Observation Means.—The presence of many field artillery units in a given area requires that all field artillery observation means be coordinated by the senior artillery commander. The available terrestrial observation points must be allocated, the limited air observation means assigned appropriate missions, and the flash and sound units coordinated as to zones of primary responsibility.

Release of Reinforcing Units.—The artillery commander makes arrangements to insure that reinforcing units are released at the time designated by higher headquarters. Such arrangements include instructions as to date and hour of release, disposition of this artillery in accordance with the directive from superior headquarters, the time at which it will move, and the routes to be used.

Reinforcements for Defense.—In general the considerations outlined above will apply when determining the artillery requirements for conducting the defense of a position.

Today we know that all the world is our battleground and that our troops must go forth through all perils to carry the attack to the enemy—that ours must be an aggressive war, bold, venturesome, loaded with the risks of daring action and distant objectives, a war in which fighters will win.

—Lieutenant General Ben Lear.

Japanese Use of Chemicals

A Report on Chemical Warfare Tactics Used Against the Chinese People

(Reprinted from the *Chemical Warfare Bulletin* October 1942)

THE CHINESE Government has made extensive claims that lethal and toxic chemicals have been employed in battle against Chinese troops since hostilities started. Investigations indicate that smoke and tear gas compositions were employed by Japanese from the start of the war, but no proof exists that lethal or toxic chemicals were employed prior to the fall of 1939.

Lethal chemicals definitely appeared on the battlefield in the summer of 1941 and were used extensively wherever the Chinese were applying pressure and the Japanese desired to conserve man-power. Vast quantities were used in very restricted areas—generally to support Japanese counterattacks. The chemical actions were never widespread, seeming to be concentrated in definite areas and to be repeated in those areas. This, of course, may be due to the tactical situation and the terrain; generally the Chinese were exerting the greatest pressure on those fronts.

The Ichang area and the Changsha area received the bulk of attacks. Chemical actions in those areas were studied by American observers.

CHEMICALS USED IN BATTLE FOR ICHANG

In the Ichang action of October 1941 a heavy attack was launched by the Chinese to take the city and carry the heights beyond where a defensive position could be organized. Chinese reinforcements were moved into the area in late September and early October. This movement was observed by Japanese planes and new dispositions were made on the defensive side, but no great number of additional troops were moved up. Artillery and mortar fire increased in intensity and considerable quantities of lachrymatory and sneeze gases were reported mixed in with the HE firing (none reported as mixed in shell with HE). Between October 5th and 8th some additional mortar companies were reported, and indications are that the bulk of chemical munitions were fired from these new locations. Chinese soldiers reported eye trouble and stomach sickness from the gas, but no deaths were reported prior to October 8th. Chinese chemical defense officers report that lethal chemicals were not used prior to the Chinese attack which was initiated about October 8th.

The attack was launched and was a success as far as taking the city of Ichang. The Japanese retired to heights beyond the city, fighting a delaying action. They organized and held a semi-circular ridge outside the city. Lethal gases were not reported as being used during the basic attack, but records, dates and times are rather confused. However, when the Chinese pressed the attack to take the ridges necessary to hold the city proper, the Japanese launched counterattacks from both flanks and great quantities of lethal gas were placed on the attacking Chinese and in the low areas behind them. Between October 10th and 12th, planes came in and dropped lethal gas bombs all over the area. The Chinese were either barefoot or wearing straw sandals and no gas masks or protective clothing were available. In the attack they were severely gassed and burned. Chinese in reserve were heavily gassed and received many casualties, most of which proved fatal. Retiring from the attack, the Chinese had to proceed through low areas to avoid machine-gun fire, and thus passed through very heavily concentrated gas barriers.

GAS WAS MIXTURE OF MUSTARD AND LEWISITE

It is very difficult to obtain accurate strength figures from the Chinese, but it appears that there were over 2,000 casualties due to gas and gun fire. Of the casualties who came out of the area, 29 were gas cases, twelve of whom died enroute to hospital. Later, six were located in hospitals and were able to give an account of the action. Only two of the six lived to return to their units.

Laboratory tests of samples of the gas and parts of shells and bombs showed the gas to be a mixture of mustard and lewisite. All symptoms noted on the casualties were those of persistent lethal gas.

A Chinese war communique reported two major gas attacks by the Japanese on the Chekiang front during the latter part of May. Attempting a forced crossing of the Sinan River near Kienteh, three Japanese planes dropped gas bombs on Chinese positions while land batteries fired gas shells at the defenders. With one third of them falling victim to the gas attack, Chinese defenders of Paishupa evacuated the riverside town.

Another gas attack, according to newspaper reports, took place at Tangki west of Kinhwa. After an unsuccessful assault against the western Chekiang railway town, the invaders released a large volume of gas on the defenders to open a way for their attack. The Chinese were forced to evacuate the town because of the gas.

According to a survey, gas used by the Japanese on the China front can be classified into six groups, three belonging to the irritant category and three to the toxic. In 1937 and early 1938, the Japanese used mostly tear and sneeze producing irritants. Since the Chinese victory at Taierchwang, toxic gases have been used with greater intensity. Gas units were attached to each Japanese regiment and storm unit, and gas tactics were resorted to with much greater frequency. Lethal and blistering gases are the main agents employed by the invaders in recent years.

MILITARY NOTES AROUND THE WORLD

AUSTRALIA

The War Effort:

The strength of the Australian Army was more than tripled in 1942. Munitions production was increased tenfold. War expenditures amounted to 40 percent of the national income. Seventy percent of the entire male population of Australia between the ages of 14 and 65 are now either in the armed service or engaged in the war industry. More than 500,000 persons are employed in the Australian war industry. *(Pravda, Moscow)*

INDIA

India's War Effort:

Indian troops numbered only 170,000 when the war begun. They now number over 1,250,000 exclusive of soldiers serving abroad—all volunteers, and increasingly officered by Indians. Recruits are accepted at an average rate of 50,000 a month as equipment becomes available for them. Approximately 300,000 Indian soldiers are serving overseas.

In addition to the Royal Air Force units in India, there are ten squadrons of the Indian Air Force, the personnel of which is entirely Indian except for a few technical instructors. Indian Air Force pilots have served with distinction, particularly in Burma, and Indian pilots are also serving with the Royal Air Force in Britain.

The Royal Indian Navy served with "conspicuous efficiency" during the East African campaign, fought in the Java Sea, helped to evacuate 40,000 Indians from Burma, and has kept the Red Sea routes open. Consisting of only ten or twelve small ships at the outbreak of the war, the Royal Indian Navy has added corvettes, minesweepers, and sloops, with an increase in sea-going personnel of over 600%. There are also over 40,000 Indian seamen serving in the merchant ships of the Allies.

India is producing 90% of her own war equipment, as well as supplying other members of the United Nations. New industries are being developed. Machine tools, formerly imported, are now being made by over fifty firms. A heavy chemical industry is being developed and India now makes 60% of her medical supplies. All Indian shipyards are working to capacity building corvettes, minesweepers, and patrol boats vital for antisubmarine warfare.

(Fifty Facts About India)

GREAT BRITAIN

The 25-Pounder:

The British have now mounted their 25-pounder field gun on the chassis of a Valentine tank to give it greater mobility. [For an account of this famous gun see the *Military Review* for January, 1943, pp. 62-63.] *(Newsweek)*

AFRICA

Captured Enemy Matériel.

Captured by the British Eighth Army in the Western Desert: A Russian gun mounted on a Czech tank, used as a German 50-mm antitank weapon.

Pictured above is the new German heavy tank employed in the recent fighting in Tunisia. Among other weapons it carries the 88-mm gun. The wide caterpillar treads are designed for desert warfare.

(Deutsche Allgemeine Zeitung)

Antitank mines removed from a captured enemy airport.

Anti-personnel mines. Over six hundred of these were removed from a captured airport.

(The Illustrated London News)

GERMANY

Preparation for Sea Warfare:

The United States and Great Britain may look forward to Germany launching her greatest sea and air attack on merchant shipping soon. The present German U-boat pack is conservatively estimated at between 300 and 400 vessels, with new craft being completed at the rate of 20 a month. In addition, the Luftwaffe for some time has been developing long-range, high-altitude, multi-engined aerial battleships such as the United States introduced to the world at Lille last October in the Boeing *Flying Fortresses* and Consolidated *Liberators*. The Focke-Wulf 200K2 *Kurier*, a four-engined bomber, was active at the start of the war in spotting convoys and reporting their locations to U-boats. The superior armament and speed of Allied planes, however, placed the *Kurier* at a disadvantage and during the past six or eight months its activity in long distance flights at sea has diminished considerably. German designers and plane factories have been working diligently to develop a plane capable of slugging it out with the *Fortress* and the *Liberator*. The Heinkel 177 has been in process of development for several years. It is a monoplane with four 1,150-horsepower Mercedes-Benz engines combined into two units, each pair driving a four-bladed propeller, and is said to have a range of 7,000 miles which would qualify it for long distance cooperation with U-boats in mid-Atlantic. This summer Germany should have her new heavy type aircraft ready for action, striking at Allied convoys in cooperation with U-boat squadrons far out in the Atlantic.

(Aero Digest)

Air-Ground Tactics:

According to Lieutenant-Colonel Nikolai Denisov of the Soviet Air Force, the Germans last summer used their aircraft both to support land troops and to attack the Russian rear and reserves. When the Germans met with their first reverses, special bomber squadrons equipped with improved Junker 88's and Heinkel 111's were created to stage heavy raids deep into the Russians' rear. However, as the German pool of skilled pilots grew less, the raids diminished.

Today the German Air Force is concentrating on single sectors in an effort to deal an overwhelming air blow. It no longer engages in such costly experiments as the use of Focke-Wulf 58 trainers for night bombing. Instead, heavy bombers are sent against specific and limited targets, to precede or support land attacks.

(Newsweek)

Rommel's Generals:

The campaign in North Africa has taken a relatively high toll of Afrika Korps senior and staff officers. Some have been killed in action: three German divisional commanders are buried in Derna cemetery alone. Some have been killed in accidents. Some have been taken prisoner. Others have not got on with that difficult personage, Field Marshal Rommel, and have been sent packing.

Take the experience, for instance, of the 21st Panzer Division, at present commanded by Generalmajor von Randow. The first commander, Generalmajor Johann von Ravenstein, was captured by the British and is now a prisoner of war in Canada, whence, by the way, he has written home expressing considerable satisfaction with his comfortable and carefree life. Von Ravenstein was succeeded as commander of the 21st Panzer Division by Generalmajor Georg von Bismarck, who was killed in action in September.

In fatal casualties, the 15th Panzer Division has been even unluckier. Already two of its commanders—Generalmajor von Prittwitz and Generalmajor Neumann-Silkow have been killed in action.

Death, ill-health, or a rumpus with Rommel have caused a number of changes in the command of the 90th Light Division. One commander, Generalmajor Summermann, was killed in action. It is he, along with Generalmajor von Prittwitz and Generalmajor Neumann-Silkow, who is buried in the cemetery at Derna.

In addition to the above, General der Panzertruppen Ludwig Cruwell, formerly G.O.C. Afrika Korps under Rommel, and also Generalquartiermeister Schmitt are both prisoners of war in British hands.

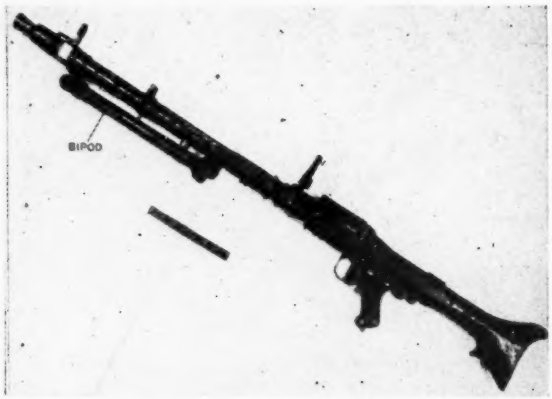
Now casualties have begun again in North Africa. Since the commencement of the Eighth Army's attack, General Ritter von Thoma, commander of the Afrika Korps, has been captured and General von Stumme killed. We hope other generals will follow.

(The Fighting Forces)

The 7.92-mm Machine Gun, MG 34:

The MG 34 is the standard machine gun of the German Army. It is a short-recoil-operated, belt-fed, air-cooled, dual-

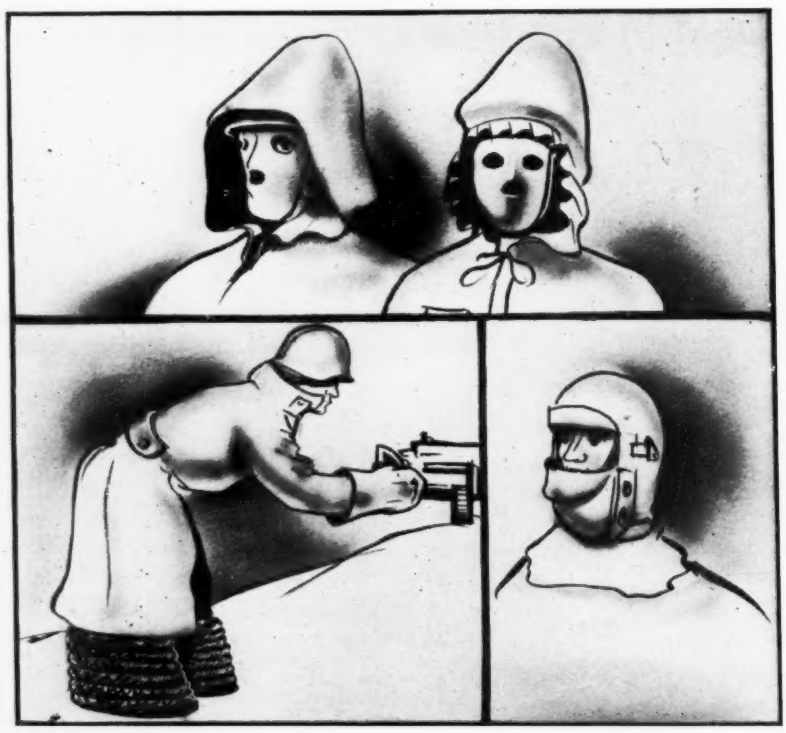
purpose gun with a caliber of 7.92-mm (cal. .312). It has an overall length of 48 inches and a barrel length of 23½ inches. The rifling has four lands with right-hand turn. The gun has a rate of fire of 800 to 900 rounds per minute. It is equipped with a blade fore sight and an open U rear sight, graduated from 200 to 2,000 meters, and it also has auxiliary antiaircraft sights. The gun, ployed, each belt containing fifty rounds, but it is common practice to join as many as five belts end to end. A 75-pound cartridge drum can also be used. Tests at Aberdeen Proving Ground led to the conclusion that the gun is simple and easy to disassemble in the field; its general functioning is excellent but it is extremely critical to adjustment, lubrication, and foreign matter; its stability is good; its



with bipod, weighs 26½ pounds. It is referred to as "dual-purpose" since it can be used as a light machine gun on a bipod or as a heavy machine gun with a tripod mount. On a suitable mount it is also used for antiaircraft purposes. In some cases a twin antiaircraft mount is used on which a pair of guns is mounted side by side. Belt feed is normally ease of changing a hot barrel is excellent; its belt lift is good, and its resistance to heat is very good. However, its full-automatic accuracy is very poor due to the severe recoil, its rate of fire is too high for a light machine gun, and its functioning in dust and in extreme cold is poor.

(Army Ordnance)

Protective Winter Clothing.



The above figure shows the type hoods, face masks and straw overshoes devised by the Germans for protection against the severe colds on the Russian front.

(Deutsche Allgemeine Zeitung)

JAPAN

The Shipping Problem:

On the evidence of her own experts Japan must possess at least 20,000,000 tons of shipping in order to construct and develop her so-called co-prosperity sphere. She came into the war, it is believed, with rather less than 7,000,000 tons of merchant shipping—that is, about a third of what her experts now advance as the minimum requirements for victory. During the first year after Pearl Harbor she lost 1,000,000 tons definitely destroyed by the Allies, and another 1,500,000 tons "probably sunk." Foreign estimates place Japan's annual production of merchant shipping at 600,000 tons, which has probably been reduced by the urgent need for more warships and the heavy demands on her docks for ship repairs. When it is recalled that the Allies, in one period of twelve days, sunk 150,000 tons of Japanese shipping in Rabaul harbor alone, representing about a quarter of Japan's annual replacement capacity, it will be clear that the 20,000,000-ton goal is a long way off.

The figures given above appeared in a report to the *Manchester Guardian* from their special correspondent at GHQ in India. The report states that this information is being broadcast from India to the peoples living under Japanese occupation in the Far East. These peoples have seen for themselves what desperate methods the enemy is using to alleviate his condition by confiscation, by the salvage of wrecks in the harbors of Malaya and Java, and by pressing into his service wooden junks and primitive rafts to transport produce formerly carried in the great ships of all nations.

With a glut of rice in Burma and of sugar in Java, all that Japan has been able to do has been to tell these countries that they must become self-sufficient. The Japanese concern at their own inability to provide ships for their ambitions is plain for all to see in recent writings and broadcasts from Tokyo.

(Manchester Guardian Weekly)

NEW ZEALAND

Military Strength:

The New Zealand army is 160,000 strong as against 16,000 before the war. There are 30,000 men in the air force. 10,000 New Zealand soldiers are fighting beyond the boundaries of this island.

The New Zealand navy is ten times as strong in manpower as before the war.

(Pravda, Moscow)

U. S. S. R.

Comments on the Russian War:

An outstanding cause of Russian success has been the increase in artillery of divisions and higher units, which artillery stays in line, with mobility capable of following the type of division to which it is attached. Against the Russian heavy artillery, the usual type of field fortification has become nearly useless.

Both sides in this war are increasing the percentage of armored and motorized troops. The danger of having a large block of foot troops in line is shown by what happened to the slow German infantry divisions around Voronezh. The present tendency is to reduce foot troops to a minimum.

Reports indicate that guns and tanks in line are steadily becoming larger. The small gun—75-mm or less—and the small tank still have restricted uses. In battle they cannot stand against the larger guns and the larger tanks. How far this increase will go is not yet known, but the end is not in sight. For battle, each side is attempting to have a larger number of big guns and big tanks than the other side. This race is definitely on.

(From "The Campaigns in Russia," an article by Col. Conrad H. Lanza in the *Field Artillery Journal* April 1943.)

1942-1943 Winter Offensive:

Results of the Russian winter offensive brought the reconquest of 185,328 square miles of German-occupied Soviet territory. The greatest depth of penetration by the Russian Army was 435 miles.

(Newsweek)

UNITED STATES

Womanpower:

It is estimated that 29% of American women can be classified as "employed," 9% of them in war work. In 1942, 23% were employed, 6% in war work, and in 1940 the figures were 17% and 2% respectively. By way of comparison, it is interesting to note that in 1939, at the beginning of the war, 37% of German women were classed as employed.

(The Army and Navy Woman)

All-Wood Army Transport:

The first military transport plane of the present war to be built almost entirely of wood and other nonstrategic materials is the new "air freighter" named the Curtiss *Caravan* (C-76) now nearing completion in a plant of the Curtiss-Wright Corporation. It is a high-wing monoplane with a wing span of 108 feet, is 68 feet long, and is powered with two 1,200 hp engines. Its landing gear is of the retractable tricycle type assuring maximum maneuverability on small landing fields, and its cargo floor is only 36 inches from the ground, thus facilitating rapid loading and unloading of cargo. The control compartment is situated above the forward section of the cargo space and accommodates a pilot and co-pilot, with provisions for a radio operator when desired. The plane is said to possess maximum efficiency as a low-stalling-speed plane for transporting paratroops, airborne task forces, field artillery, and other military cargo over short runs of from 600 to 700 miles with frequent stops.

(Army Ordnance)

Expanding Army Motorization:

The mechanization and motorization of the Army is producing a great variety of specialized vehicles. There is, for example, a complete lubricating system on wheels, built to travel 50 miles an hour over hard-surfaced roads and capable of performing in the field any lubricating job that can be done in the shop. The first office trailer to be used in the Army was recently built, complete with built-in office equipment including electric lights and telephone facilities. The Quartermaster Corps has developed a portable laundry unit to take care of the weekly laundry of about 1,500 men. It is mounted on a four-wheel semitrailer with a washing machine, an extractor to remove surplus water from washed materials, and steam-heated tumblers for drying them. A new mobile sales commissary is mounted on a 2½-ton truck carrying a driver, four clerks, and a stock of goods sufficient to supply about 8,000 men in the field with cigarettes, candy, razor blades, and some 60 other articles. The Army recruiting service has trucks and trailers for use in areas where there are no established recruiting stations. They carry streamlined office facilities and complete living quarters for five men. A variety of "mobile classrooms" are in use. Those used for training Army officers in truck mechanics, for example, are staffed by a driver and two instructors, and are equipped as traveling mechanical schools with various types of engines, transmissions, axle assemblies, and other vital parts of trucks. In many other ways motor vehicles are being developed for specialized functions in the service of the Army, apart from their well-established uses as tanks and transports.

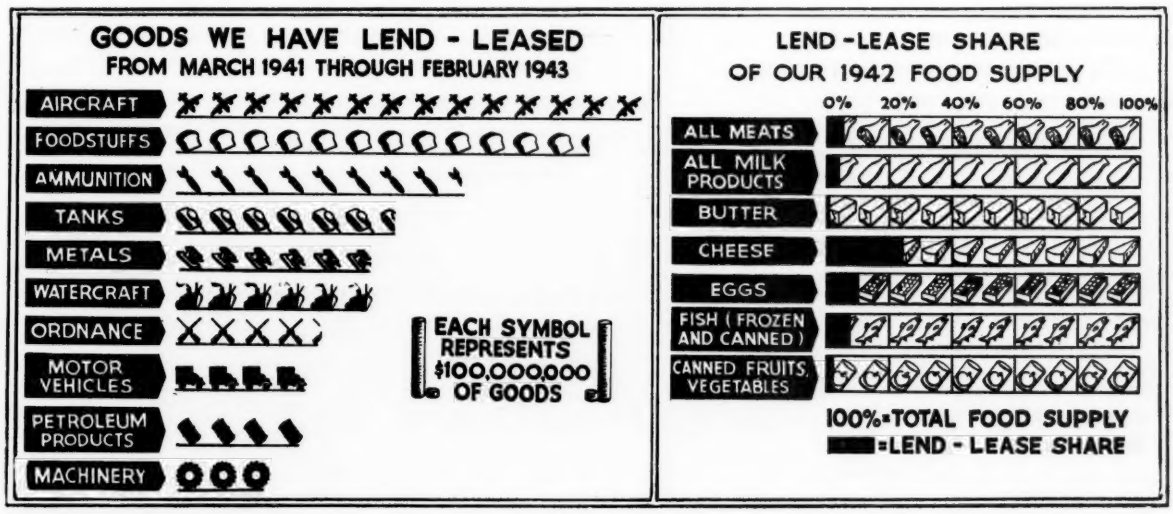
(Scientific American)

Blimps vs. Submarines:

One of the most effective aerial weapons against the U-boat is the blimp. We have 200 of these non-rigid craft on order. The blimp has been greatly improved since the last war. The K2, K3, and L2 are the latest models being used by the Navy. These types are 250 feet long and can cruise from 2,000 to 2,500 miles. Their maximum speed is from 65 to 80 miles per hour, but the value of a blimp on submarine patrol is not speed. It is its ability to hover over suspicious objects and to stay aloft for a long time. They can remain on patrol duty for days or even weeks if necessary, for they can be refueled and new crews can be transferred at sea. Being inflated with helium, they are non-inflammable and in no danger of catching fire if the huge gas bag is sprayed with incendiary bullets by an enemy plane.

The blimp carries depth charges for use when a submarine is spotted, but generally a surface ship is called by radio to do this task. For protection, the blimp is also armed with a number of machine guns.

(Aero Digest)



FOREIGN MILITARY DIGESTS

Digests of articles from foreign military periodicals. Other items of interest from foreign publications are indicated in the Catalog of Selected Periodical Articles.

Open Sights or Mumbo-Jumbo?

[Extracted from "Tactics of Artillery," by Ultima Ratio, which appeared in *Journal of the Royal Artillery* (Great Britain) July 1942.]

That artillery must learn to come out in the open instead of doing "mumbo-jumbo behind a hill" is the advice of a British military writer. Miksche, in *Blitzkrieg*, strongly urges that artillery should fire over open sights at "actual targets rather than at areas." He deprecates "complicated techniques" and points out that direct fire at short ranges uses less ammunition than indirect fire at longer ranges.

The last argument we may concede at once; but the compensating advantages of firing from covered positions further back more than outweigh the slight saving of ammunition. Guns so situated:

i. cannot be neutralized or destroyed by the same fire as is neutralizing or destroying the infantry in front. This is particularly important in defense;

ii. can transfer their fire with greater flexibility to other sectors of the front;

iii. can initiate or break off engagements with greater freedom;

iv. can more easily be supplied with ammunition since, in spite of the "all round fronts" of modern warfare, supplies still come up from the rear; and

v. can form the core of the middle area of the defense in depth lay-out.

The suggestion that all indirect laying is aimed at areas not "actual targets" cannot, however, be admitted. It is true of *purely predicted* shoots, but when the gunner can observe and correct his fire he will always go for a direct hit if the dimensions of the target, the zone of the gun, and the time available justify the attempt. And in the absence of these conditions he will fare no better with direct laying.

As for "mumbo-jumbo" and "complicated techniques" it may be pointed out that that sort of thing made possible the surprise barrages of Cambrai and of March 21, 1918.

There is, however, some justice in Miksche's general condemnation of the "gunner officer—once so dashing and audacious—now become a geometrician and over-theoretical mathematician." But this kind of decadence is not, at any rate in the British Army, as universal as he thinks.

The complicated techniques elaborated in peace-time have not, in fact, stood the test of modern war. And it may be claimed—or admitted—that the average British gunner prefers dashing about to doing sums. It is not without significance that a sentence in the pamphlet which modified the ritual of the Stages begins: "This, no doubt welcome, change . . . ."

While, therefore, it would be undesirable, for reasons given, to adopt the "forward gun and open sights" policy advocated by Miksche, we can, by giving certain units a specialized role of close support for minor operations, provide increased scope for the dash and audacity of our gunners.

There must always be regiments to perform the routine tasks of defensive fire, program shoots, etc.; and they cannot be absolved from their "mumbo-jumbo." But when the gap is made, the special batteries can dash through and play at horse artillery. They can revel in "half-cock" positions and voice control OP's. They can, if they like, engage machine-gun nests over open sights—though they would be well advised to do so from beyond machine-gun range. But they should never lose sight of the principles:

i. that the shell is their weapon;

ii. that a troop in motion is four guns out of action.

Whether the ordinary field gun is a suitable weapon for this galloping role or whether the 18-pounder or 75-mm would be better is a question which cannot be discussed here. But we will not dismiss our special batteries before pointing out that they would form a powerful reinforcement to the antitank defenses of the division.

The Germans made no great success of the creeping barrage in March 1918. Nevertheless this attack and the subsequent thrusts from the Lys to Chateau Thierry achieved remarkably deep and rapid progress. In fact the Germans did better without the creeping barrage than the Allies had done with it.

It was natural, therefore, that they should lose interest in barrage and should devote their attention to the infiltration tactics which had proved so effective in piercing our defenses. They discovered also, later in the year, that tanks were not freaks but practical weapons which could profoundly influence, or even force, the decision.

These were the two lessons on which the Reichswehr brooded during the years of peace. The Treaty of Versailles restricted their artillery equipment, but that only freed them to devote themselves without distraction to perfecting their infantry infiltration tactics which were not dependent on artillery support.

The Treaty also debarred them from the practice of tank tactics, but the theorizing they did has been proved good by results.

Their artillery method, however, seems to show no development. The Russian Colonel, Malitsky, has recently described the German methods on the Eastern front. "Artillery preparations," he says, "consist of moving fire at intervals of 100 to 150 meters. Such fire is kept up to a depth of 3 or 4 kilometers (2 or 2½ miles) repeated several times, and concluded with an artillery attack on the main line of resistance."

What is this but the old "area strafe" of 1917?

It seems, then, that German gunners, though technically well equipped, are tactically still in the Napoleonic stage. They aim at the annihilation of the enemy by concentrations.

It is true that their manuals suggest a secondary object, which is to stun the defenders and make them temporarily incapable of using their weapons. However, this is but a slight refinement on the bludgeon stroke.

For close support they still adhere to the open sights method to which, as has been shown, grave exception can be taken. They have tried to strengthen their case by introducing the semi-armored self-propelled "assault gun." But to this the British gunner will find objections on other grounds.

As for Stukas, the "modern artillery," it is now generally recognized that the striking successes which they have scored will not be repeated and that, perhaps, they should never have been scored at all. The fact, however, that the Germans used this substitute is additional proof of their lack of interest in artillery tactics.

The general trend of this article has been to criticize the Germans for the concentrations methods of their field and medium artillery and for the opensights methods of their close support guns. But certain conditions on the opponents' side provide favorable ground for the success of these tactics. These may be indicated by considering the following points:

i. Concentrations are most destructive against troops who are massed in well-defined localities.

ii. When the aim is neutralization by stunning, the German procedure is likely to be to neutralize one of two mutually supporting localities while

the other is attacked or, better still, to neutralize both localities while infantry or tanks infiltrate between them.

iii. When the localities are thus outflanked their destruction can be undertaken. Down come the concentrations again; and, under cover of them, close support weapons are brought up to open positions at short range.

There seems to be a moral in this—for hedgehogs!

The general moral, however, is that since British artillery tactics have been, on the whole, sounder than German, it would be a mistake to abandon ours and to adopt theirs. The British method of *attacking the position which is being neutralized and while it is being neutralized* is likely to surprise the enemy.

We cannot, perhaps, except with six months' battle experience, train our infantry to follow less than 100 yards behind the barrage. But we have carriers. These can hang back *200* yards behind the barrage and yet, when the lift comes, can cover that space in half a minute. And we can crowd quite a few extra men on to the carriers to form the first wave.

Use of Small Tank Formations in Wooded Hill Country

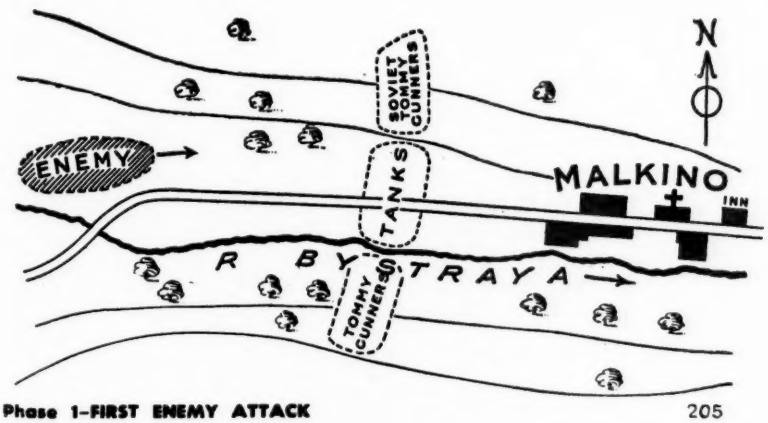
[An article by Major P. Slesarev, Soviet Army, which appeared in *The Tank* (England) January 1943.]

The use of massed tanks in wooded hill country is extremely limited. Slopes steeper than 25 to 30 degrees hinder movement of tanks, at times making it quite impossible. The enemy mines places passable for tanks in order to hinder their movement. Dense forest and overhanging cliffs make observation difficult except at very close quarters. In consequence of poor visibility aimed fire can only be conducted from the tank at short range targets. Experience has, however, shown that small tank formations from a platoon to a company of tanks operating in valleys and mountain river beds can, if the attack has been well prepared and the locality thoroughly reconnoitered, be very effectively used. Effect is greatly increased by organized coordination between tanks, artillery and infantry and surprise in the tank attack.

In one of the mountainous sectors of the Soviet-German front, German tanks had forced their way into a valley. There were about 40 tanks moving in column along the only road. A company of tanks with automatic riflemen under the command of Senior Lieutenant Erofeyev was given the task of checking the enemy at the village of Malkino. The tank unit reached the village after a twenty kilometer march and deployed in line on the western side of the village from which direction the German tanks were expected to come. Tommy gunners and infantrymen in the village took up their positions on the flank of the tank company, protecting it from sudden attack by German tommy-gunners. Such distribution of forces has frequently justified itself. In wooded hill country the Germans often send infantry ahead of their tanks. They comb the undergrowth striving to exterminate the crews of the Soviet antitank guns and to point out the more negotiable slopes to their tanks, being at the same time a fighting patrol and the first attacking wave. For this reason German tanks sometimes appear suddenly on the flanks or in the rear of the Soviet troops. Infantry observers posted on flanks of inhabited point protected the tanks from such surprises.

In the afternoon German tanks appeared out of a copse some two kilometers west of Malkino. Without stopping they moved towards the village at full speed. Senior Lieutenant Erofeyev's tanks decided to permit the Germans to get as close as possible and then shell them with controlled volleys. This was a correct decision for the Germans were advancing without reconnaissance and did not expect to meet with resistance of armored vehicles at Malkino.

When the enemy tanks were within 1,000 to 1,200 meters our tanks opened fire with their cannon. After the first few volleys two German tanks burst into flames. The remainder began to deploy hastily on both sides of the road. Deployment and the adoption of battle order occupied about five minutes and the Germans advanced a further 300 or 400 meters conducting unaimed fire. Fire from our stationary tanks was so accurate that during this time another six enemy tanks were knocked out. Half of them were burnt. The German tanks couldn't withstand our gunfire and retreated. This was the moment when reinforcements arrived at Malkino consisting of an antitank battery and several lorry loads of soldiers, amongst them several tank destroyers with antitank rifles.



Phase 1–FIRST ENEMY ATTACK 205

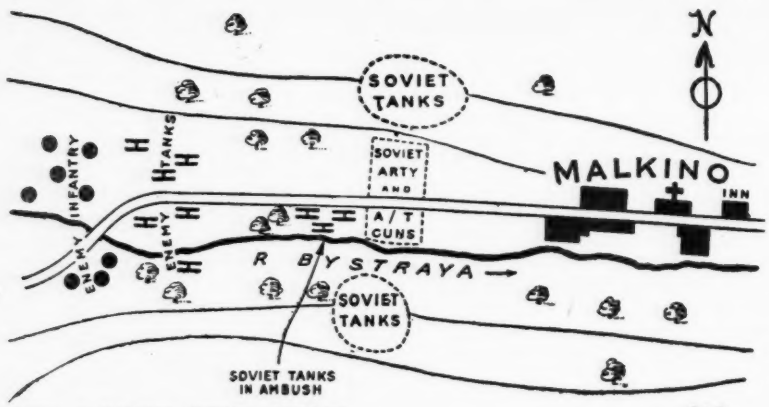
The commander of the tank company arranged with the artillery and infantry commander to coordinate their activities for the second German attack which was anticipated.

The whole tank company, except a platoon left in ambush at the river Bystraya, took up position amongst bushes on the slopes of the hill. Gunners and antitank men and tommy-gunners occupied the tanks' former position.

The tanks were to attack when the German battle order had been disrupted by fire of antitank guns, rifles and tommy-guns. The main drive was to be against the German infantry which hadn't been badly beaten in the previous attack. After dispersing the infantry our tanks were to concentrate their fire on the German tanks in cooperation with their antitank guns and "tank destroyers." It was assumed that the Germans, caught between the fire of tanks and artillery and being unable to get out of the trap through the hills would be forced to turn about and retire to their own lines.

Two hours later the Germans again attacked the village of Malkino advancing in the same formation as before, one company on either side of the road. The only difference in method was that their attack was now supported by a battalion of automatic riflemen advancing 100 meters behind the tanks. Suspecting a threat from the flank the Germans advanced at full speed. As soon as the tanks approached within range of accurate fire the gunners and "tank destroyers" with their antitank rifles got into action and opened withering fire on the enemy tanks. The enemy infantry were pinned to earth by our fire but the tanks separated from their infantry continued to advance. Six German tanks were already in flames. Their column formation was disrupted. Many tanks left the battleline. The enemy was obviously in a quandary. The time was suitable for an attack by part of the tank company which was lying under cover of bushes on the slopes of the hill. On the signal being given our tanks opened machine-gun fire on the enemy infantry and cannon fire on the enemy tanks. The effect of this sudden attack was so strong that the remaining German tommy-gunners fled in groups and individually. Several of our tanks, completing the rout of the enemy infantry, exterminated those who escaped their machine guns with their tracks. The remaining tanks concentrated their fire on the German panzers. The latter tried to take cover amongst bushes along the river Bystraya but came immediately under fire of a tank platoon stationed there and which had remained all this time in ambush. Tanks turned left and, skirting heights, hid in the woods whence they returned to their original starting point.

From the above it can be seen that the Germans ran into a well planned fire trap. In the second skirmish they lost over 200 men and 11 tanks. Altogether that day the enemy lost half his striking force. This success wasn't accidental. If the commander had placed his tanks in the first battle as he did in the second then their fire would have been so weak that the Germans would undoubtedly have got through to the village of Malkino.



Phase 2-SECOND ENEMY ATTACK 205

Then taking advantage of his numerical superiority the enemy would have destroyed the two tank groups separately for they were left without a road along which to retire.

When reinforcements arrived there was no longer any sense in concentrating fire strength in one place. During the second attack antitank gunfire and cannon fire of our tanks was conducted along centerwards radii of circle in which Germans were located. The enemy counterfire distributed in three directions wasn't very effective.

Thus correct distribution of fire strength in both phases of the battle enabled our commander both to rout the enemy and repulse him as well. If narrow mountain defiles are properly used then a successful struggle can be carried on by small forces against superior enemy forces.

In wooded hill country every tank maneuver must be planned from every view point. Tank attacks are usually easily planned from an engineering viewpoint on account of the fact that tank units from platoon to company usually attack in one direction. In particular each tank must be able to identify its own course. This is usually done in one of two ways either the bark of the trees is cut at about driver's eye level or trees are painted at same level, with a dab of lime. It is very important that before the attack begins the route should again be examined by sappers and any mines there rendered harmless. It is not unusual for the Germans to throw mines in the path of advancing tanks at the very last moment. Getting them cleared in time ensures complete safety of our tanks and prevents interruption of the action.

During the tank attack cooperation with antitank artillery must be carefully worked out. In the event of the appearance of counterattacking enemy tanks it is often advantageous to withdraw tanks to one side and save them for the attack on the infantry. Enemy tanks which are few in number can be dealt with by antitank guns and rifles. This is what happened on one sector of the front. Six Soviet tanks under command of Lieutenant Postikov went into the attack. Before them went infantry and automatic riflemen. At the same time German tanks launched a counterattack supported by infantry.

Our tanks split into two groups and took cover, allowing enemy tanks to pass then opened machine-gun fire from both flanks on the German tommy-gunners who were advancing 50 to 80 meters behind their tanks. The tommy-gunners immediately dropped groundward thinking they were attacked by Soviet infantry and began to fire in reply. The Soviet tanks, waiting until the German panzers disappeared in the woods, attacked the enemy infantry from both flanks and annihilated over a company of them.

The gunners in their turn, having received warning from the tanks, began shelling the enemy machines. Two of them caught fire, the remainder tried to retreat but came under the fire of Soviet tanks waiting for them in ambush. The German counter-attacking group was almost completely annihilated. Thanks to close cooperation with artillery the Soviet unit didn't lose a single tank.

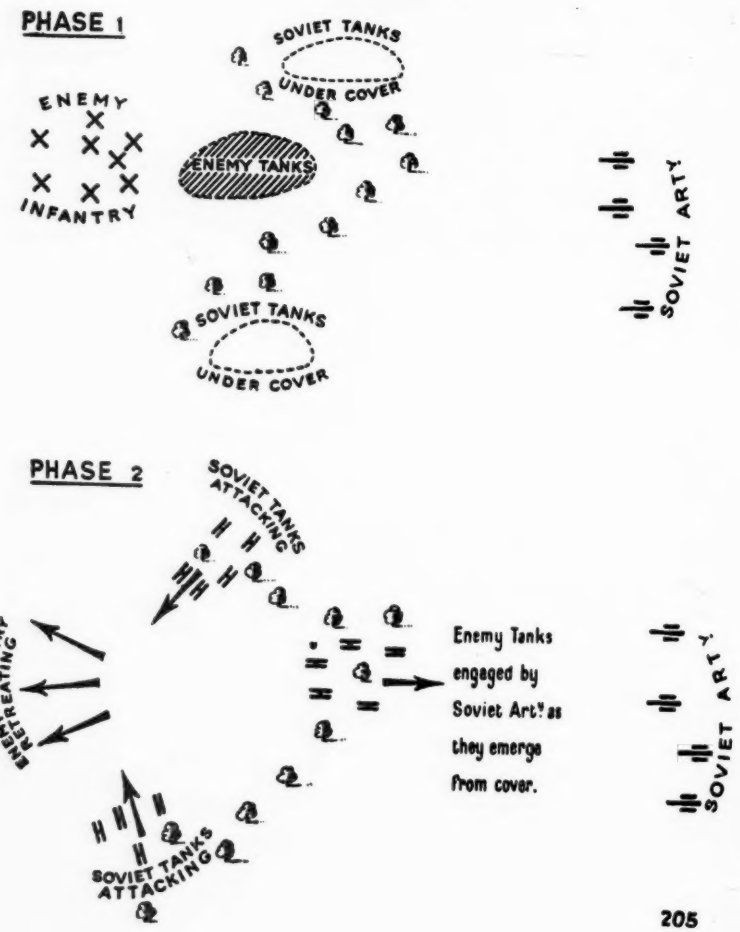
It is often advantageous to use single tanks for an ambush to destroy enemy infantry. They're usually hidden in bushes near wide roads or open fields. The tank in ambush is protected by a group of automatic riflemen.

When the German infantry launches an attack the Soviet infantry with their fire pin the Germans down to earth in the open space where they're then attacked by the tank from ambush. The effect of such attacks on infantry is all the greater if tankmen have a supply of hand grenades which they can throw through the hatches.

In wooded hill country an able combination of movement and controlled fire with the action of small tank groups make possible successful action against large enemy forces. Experience in defending mountain valleys has shown that tanks rendered irreplacable assistance to infantry when cooperation has been correctly organized.

LIEUT. POSTIKOV'S ATTACK

(Diagrammatic)



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Experience in Action Against German Mortars

[Translated at the Command and General Staff School, Fort Leavenworth, Kansas, from a Russian article in *Krasnaya Zvezda.*]

Mortar fire occupies an extremely prominent place in the fire system of German infantry. In both offensive and defensive action the Germans widely employ mortars, striving to neutralize and suppress our fire agencies and defeat our manpower.

Combat experience shows that during offensive action the Germans begin the use of mortars as soon as their artillery completes its action against the outer edge of our defense and transfers its fire into our rear. Operators of German mortars then proceed to try to silence those of our firing positions which revive after the artillery barrage, and thus to provide protection for the advance of their infantry. When the enemy infantry launches its attack, the mortars transfer their fire against our rear defensive installations. At the slightest reverse of the attack the Germans renew mortar fire against our front line defensive positions in order thus to protect their infantry from our fire.

When on the defensive, the Germans open mortar fire as soon as they discover concentrations of our infantry or any of our engineer activity. When our units are advancing the enemy directs his mortar fire for the most part against the rear of these units, while our advance elements are subjected to the fire of automatic weapons, rifles, and machine guns. There are times when the enemy fires simultaneously against all targets, but this takes place only when he has available a sufficient quantity of light and heavy mortars.

In all instances the Germans try to employ their mortars in mass. The purpose of this method is clear—to create powerful, insurmountable fire. They care less for the accuracy of their fire than for the moral effect produced by the detonations of a large number of projectiles. They particularly strive for this effect when opposed by inexperienced infantry. But when our personnel is composed of men with combat experience, massed mortar fire does not frighten them. They know how to protect themselves against mortar shells.

During offensive action the best method against mortar fire is a speedy forward movement in order to escape the zone of enemy fire. It is known that the Germans direct their mortar fire on a definite area for a definite time period. To leave that area as soon as possible means to suffer fewer casualties. Good protection against enemy mortar shells is provided by trenches and irregularities in the terrain. By hiding in them our men find protection from shell fragments.

The company which I commanded was more than once subjected to mortar fire. Following the rules outlined here it suffered but small losses during offensive action, and no losses at all while on the defensive. Once the company was given the mission to throw the Germans from a hill which they were occupying. The company's attack was a surprise to the enemy who was compelled to abandon his trenches on both the front and the rear slopes. However, the enemy was only pressed back, he was not defeated. We were expecting that at daybreak the Germans would attempt to restore their position by counterattacks which would be supported by mortars. It was taken into consideration that most frequently the Germans directed their mortar fire against the rear of our units. Therefore we transferred the entire company to the rear slope of the hill, into trenches situated closer to the Germans.

This maneuver fully justified itself. The Germans concentrated the full force of their mortar fire on the trenches in our rear, on the front slope, where there was none of our personnel. The enemy infantry, when it launched its counterattack, was met by the coordinated fire of the entire company. Having lost about one-half of their men, the Germans were rolled back. It is clear that they had anticipated that our forces would be placed in depth and that part of them, pinned down by mortar fire, would remain inactive, while our advance elements, thus deprived of support from the rear and unable to withstand the counterattack would be crushed. These expectations of the enemy were thwarted.

Observation of enemy tactics has established the following facts: When the enemy carries on mortar fire simultaneously from several positions for ten minutes it means that their units are well supplied with mortars. When the Germans rotate their fire, opening it first from one then another position, each time firing about ten rounds, it may be assumed that they have few mortars and that they are thus maneuvering these weapons in order to create the impression that the fire is massed. Even when lacking a sufficient number of shells the enemy makes efforts to conceal his true situation.

When the front is more or less quiet the Germans open mortar fire at certain hours of the day. In one sector they regularly subjected our positions to mortar fire at 1200 o'clock, and more frequently at 1400 o'clock. What was the reason for this? Very simply because at that time our field kitchen arrived to distribute food. The men congregated around the kitchen and the Germans made attempts to hit them.

At night the Germans fire their mortars as soon as they hear any suspicious movement or noise on our side. However, instances were observed when every night at 0200 o'clock they would fire their mortars without any visible cause. Apparently this was so-called fire for annoyance. In such cases we usually reply with similar fire for which purpose we designate targets in the daytime and prepare firing data.

Summing up the above, the following conclusions may be drawn. Enemy mortar fire will not inflict heavy losses to infantry if the latter knows German tactics and methods of defense against mortar shells. Experienced soldiers are not afraid of mortar fire. When you hear the shell making a sharp sound while on its course of flight, that shell is not dangerous for it will land somewhere in the rear. It is a different story when the shell makes a low sound while in flight; upon hearing it the men should immediately find shelter. When in the general melee of combat the shell noise is not audible and it detonates nearby, advancing men must immediately move sharply forward in order to escape the zone of fire, and when on the defensive they must immediately throw themselves to the bottom of the trench.

Enemy mortar fire must be countered without delay by our own mortar fire or by an artillery barrage. Action against enemy mortars will be particularly successful if infantry commanders are able to locate their positions quickly and to indicate these targets accurately to their own mortars and artillery.

It is certain, of course, that as the battles progress, the enemy will introduce new methods in employing mortar fire. It is essential for every commander to pay careful attention to the actions of enemy mortars, to study them daily, and wherever necessary to improvise quickly effective methods of counteraction.

Counteraction Against Turning and Flanking Movements in the Mountains

[Translated at the Command and General Staff School, Fort Leavenworth, Kansas, from a Russian article by Major R. Milovanov, Soviet Army, in *Krasnaya Zvezda* 9 December 1942.]

It is well known that foothills and mountains permit the organization of a rigid and stable defense. The very nature of the locality, supplemented with various sorts of engineer-erected obstacles and traps, makes the defense difficult to overcome. But along with that, mountain defense still has its weak features.

In the foothills, which represent a series of low, parallel crests dissected by valleys, the defense often has a discontinuous character because of the isolation of the separate heights and the limited number of roads and approaches from the rear, and is drawn up on the principles of defense on a broad front. These peculiarities are greatly accentuated in the mountains proper. Here it is generally impossible to create a continuous front line. Units and sometimes even small groups occupy only the individual promontories, mountain passes, roads, and trails, forming points and centers of resistance. They are isolated from one another and acquire a certain independence of action. These conditions create a favorable situation for turning and flanking the defensive units. Turning and flanking are further helped by the poor field of vision and the presence of dead spaces.

According to the German field manual, frontal attack is by no means required for seizing a height or other mountain position. The Germans consider it enough to turn and flank the height, and the defense manual recommends a breakthrough on a narrow section of the front.

This is precisely how the Germans actually did operate in the foothills of the Northern Caucasus. They tried to utilize every break in the defensive system, every convenient hidden approach and difficult pathway leading to the flank or rear of the defense, in order to flank and seize the commanding heights. Sometimes the Germans tried to wedge themselves

into our defense on a narrow section, endeavoring to emerge on the lines of communications and into the valleys, in order then to spread the gap and create a threat on the flanks and rear of the units defending the main positions on the mountains and slopes.

Despite these vulnerable aspects of mountain defense, it can be made thoroughly impregnable. Combat experience shows that if the commander organizes the defense wisely and takes effective measures against hostile turning and flanking units, all the efforts of the enemy to come out on the flank and rear end in failure. Moreover, the flanking units themselves often get into an unfavorable sitaution and make their way back to their own forces with difficulty.

What are the means of counteraction against turning and flanking movements in the mountains Let us try to show this by the activities of a certain unit. Its defense runs along the slopes of the heights, and at some places is on the summits of a low crest covered with a thick growth of scrub. The defense is organized on the principle of company and platoon points of resistance on the separate hills and in the mountain passes. The distance between the summits amounts at times to 1000 meters (1100 yards). The defense of each company and platoon area is, as a rule, circular. For the security of the intervals between units, constant reconnaissance explores all the hidden approaches and directions by which the enemy might filter through in small groups of automatic riflemen, and so penetrate to the defensive rear. At the junction of defensive positions a system of observation is set up that assures (insofar as the locality permits) the prompt detection of turning and flanking movements.

Besides that, each unit sends out ample security guard on the flanks, so situated as to survey the approaches not visible from the principal positions. Mortars and the artillery of the infantry support cover the intervals and dead spaces with a flanking fire, and also with fire from depth. On the flanks and in the rear of points of resistance a system of obstacles is set up, mainly mines. Such units as companies and larger ones detail reserves who may be used to carry out attacks on the flanking enemy and to intercept his course of movement. The disposition of the reserves is of great importance. In the unit of which we are speaking, they are usually located near main highways, in mountain passes, and in valleys; that is, in those places from which it is possible to send them rapidly to meet the flanking enemy.

Large intervals between large and smaller units, and the isolated position of these units, demand complete understanding between the neighboring ones, and strict agreement in fire cooperation. This is one of the chief measures directed against turning and flanking movements. In this certain unit, the junctions are reliably secured by the cross fire of the neighboring units. The chief of staff of the unit, Ermolaev, deserves great praise for the pedantic thoroughness with which he twice a day informs the staffs of the neighboring units as to the situation in his area and requests the same from them. Similar procedure is followed within the unit.

Unfortunately, the same picture is not observed everywhere. Some commanders neglect the exchange of information, considering that if everything in their sections is in order there is nothing to worry about. In the foothills and mountains such a condition is intolerable. When there is no precise agreement and complete understanding between neighbors, a favorable situation is created for turning and flanking movements against the defensive units.

Intelligently organized defense enabled this certain unit to suffer not a single turning or flanking movement on its points of resistance. And such attempts were made. Once a large force of German automatic riflemen, taking advantage of a concealed approach, filtered into a hollow between two hills in an endeavor to reach the rear. Reconnaissance exposed this flanking unit, withdrew to the combat outpost, and informed the unit commander about the observations. The scouts and soldiers of the outpost opened fire on the Germans. But the latter had an overwhelming superiority in strength and continued to filter through the hollow. Nevertheless, the outpost was able, with the help of mortars, to hold off the enemy until reinforcements arrived. Then two of our units, sent out from two points of resistance, struck the flanks of the Germans and quickly joined forces, cutting off by this move almost all the hostile automatic riflemen. The enemy was caught in the hollow. After a short fight more than half of the German soldiers and officers were killed. The rest, taking cover in the brush, hastily retreated.

Thus the best method of counteraction against turning and flanking movements is a development of defense in depth and strong security on the flanks. The commander who organizes defense in the mountains must first of all take care to secure his junctions and especially the open flanks, in order to forestall the possibility of turning and flanking movements. On the flanks it is necessary to have protection consisting of units of riflemen, reinforced by one or two heavy machine guns, and sometimes by mortars. This covering force is disposed in echelon on the flank and is in visual communication with the unit sending it out, and its fire is adjusted to that of the latter. For adequate security of junctions and flanks it is also necessary to have continuous reconnaissance, reliable outposts, obstacles on the open flanks and to the rear, correct disposition of reserves, and constant communication with adjacent units.

But this still is not all. No expedients will save the defense from turning and flanking movements if it acts irresolutely. Passivity and vacillation inevitably lead to loss of initiative, to the movement of the enemy on the flanks and rear, to the disintegration of the combat formation, and finally to the encirclement of individual units by the enemy. Defense in the mountains must always be distinguished by an activity which includes not only the successful maneuvering of reserves with the purpose of annihilating the flanking enemy units, but also the constant forcing of our will on the enemy. The defense in its turn may threaten the enemy with turning and flanking movements of its own. Superiority in strength is not at all necessary for this. In the mountains even such small units as platoons and squads can perform tasks not possible for companies and battalions under ordinary conditions.

In that unit mentioned before, the forces in defense not long ago seized several hills. A platoon under the command of Senior Lieutenant Karasyov, flanking a small hill held by a reinforced German platoon, drove the enemy out with a determined attack on the flank and rear, and captured three machine guns and two prisoners. The Germans left 41 dead on the hill, while our platoon lost only two men, with seven wounded.

We mentioned above that the Germans sometimes try to make a thrust on a narrow section, endeavoring to break through into a valley and come out on the flank and rear of our units defending the heights. Such an enemy maneuver is all the more dangerous, as it is often carried out with large numbers of infantry and tanks, and may lead to a deep flanking of whole divisions. Consequently the defense of mountain valleys and passes into them demands particular care from officers of all ranks. The experience of fighting in the Caucasus has proved that for direct control of the valleys it is first necessary to secure the commanding heights, along which the valley usually extends. Cross fire from the adjacent mountains and slopes is the best way to defend the valley. It is expedient to leave only small forces, reinforced with antitank and fire units, on the floor of the valley.

In one area our defense stretched along the northern slopes of a crest extending from east to west. Three regiments of hostile infantry, supported by tanks, broke through on the junction between our units and made for the pass. The Germans seized it and moved out into a valley between the mountains. Two days later more than 100 tanks and about two infantry regiments undertook an attack along a valley to the east, in order to complete a deep flanking of the ridge from the south and to emerge in the rear of our positions in the mountains. At this time our command shifted the reserve units to the place of the prospective breakthrough; this shut off the valley completely. Rifle, artillery, and tank units were consolidated on the slopes of the mountains, and in the center of the valley, whose width was seven to nine kilometers (three and a half to five miles), a unit of antitank guns was disposed. Thus the entrance to the valley represented a pocket of fire subject to artillery and mortar action from three directions. The hostile tanks moved toward the center of the valley in three echelons. When they reached the zone of cross fire, the artillery, heavy machine guns, and tanks disposed in ambush opened up on them with a concentrated fire. Part of the artillery units fired on them with a concentrated fire. Part of the artillery units fired on the infantry, cutting it off from the tanks. The Germans took cover, while their tanks, having suffered great damage, were unable to withstand the powerful barrage fire and retreated.

After a while the enemy renewed the attack. Now his tanks and infantry separated into three groups. Two of them moved along the slopes, hoping to disrupt our fire elements and open the entrance to the valley. The third group attacked in the center. Thus the enemy had scattered his forces, and our units, taking advantage of that, crushed all his groups in detail. At the moment when the enemy attack had reached its maximum intensity and its tempo was starting to slow down under the effect of the destructive fire from three directions, our tanks rushed out of ambush and counterattacked on the right-flank group of German tanks. Immediately several hostile vehicles were set on fire and the remaining machines fell back, not being able to withstand the pressure of our tanks.

This fierce conflict lasted the whole day. The Germans did not succeed in

breaking through into the valley. They moved off to the starting position, having lost many burned and disabled tanks. The success of our units was promoted by correctly organized defense on the slopes of the heights and by its deep echeloning in the valleys.

Finally, one more observation, concerning the defense of mountain passes. Having seized a pass, the attack obtains freedom of maneuver and the possibility of emerging in the flank and rear of whole units engaged in defense. For this reason the defense of passes demands special fortitude of soldiers and officers.

After capture of the heights overlooking the pass, the units must hold them at all costs. Even if the enemy breaks through the pass and its defenders are encircled, they must stay on the spot and draw up all-around security on the heights. Holding these heights may be of decisive importance in the battle with the second echelons of the attacking enemy. Besides that, the garrisons of the heights will pin down large forces of the enemy, which will help in the launching of the counterattack. Upon withdrawal of the foe, the encircled garrisons can cause him considerable damage, since they will keep under incessant fire the entire course of the hostile retreat through the mountain passes.

Building the Bridge Across the Seine at Les Andelys

[Translated at the Command and General Staff School, Fort Leavenworth, Kansas, from a German article in *Militär-Wochenblatt.*]

Commanders of units find that ingenuity and resourcefulness are very often required additions to the formal knowledge gained in the study of tactics and strategy. This article provides an illustration of just such requirements and how the problems were met and overcome.—THE EDITOR.

On 5 June, the army corps had made a forced crossing of the Somme below Amiens, and by the evening of 8 June, had reached the region south of Grandvillers.

The 41st Engineer Battalion, the 2nd and 3rd Companies, and the headquarters had been sent ahead during the night to Feuquières for employment by the army corps. The 1st Company had been assigned for duty with a cavalry division, and bridge columns 1 and 2 of the battalion as well as the 1st Engineer column had been left behind in Croissault, the former station of the battalion. It was not planned that it should go ahead until morning, for it seemed quite impractical for these columns to continue their march by night through the town of Poix which was still burning, strongly occupied by troops, and had been attacked repeatedly by planes.

It was not known to the commander that the Seine would be reached by the next day or he would certainly have had the two bridge columns join the companies that same evening.

The orders from the army corps which were issued at 4:00 AM on 9 June, did not reach the battalion until 8:40 AM. Among other things they stated that the battalion was attached to a division and that the latter had the mission to send out advance detachments and capture during this same day the bridges across the Seine at Andè, Les Andelys, and Courcelles.

The battalion was immediately assembled and started toward Gournay. Above all it was important that the bridge columns which were still far in the rear should soon join the battalion. They were sent an order to this effect. The commander proceeded ahead to the division command post at the highway fork west of Gournay. There he received an order from the division commander to take the battalion on ahead as far as Saussay on the main highway running to Les Andelys for use by the advance detachments which were to go around Gournay, which was partly in flames, on the west. A corresponding order was issued to the battalion.

The commander proceeded to report to the commander of the reconnaissance detachment and get further orders. The narrow and, in many places, deeply rutted road which we now had to take through Avesnes made travel very difficult for it was covered with troops throughout its entire length and there was much traffic in the opposite direction. Even after reaching the large Gournay-Les Andelys highway it was frequently impossible to get through the traffic, even on a motorcycle. In the course of the efforts to move ahead, several columns had come alongside one another.

After reaching Puchay, the battalion commander's car at first met no more German troops. It was not until the commander was a few miles from Les Andelys that he met cavalry, motorcycle, and artillery troops which had been sent on ahead by the division. As he reached the east entrance to Les Andelys, he learned that the bridge had been blown up and that there were but few German troops in the city.

The commander of the 41st Engineer Company was sure that since the bridge had been blown up, it was necessary to put the entire battalion consisting at the time of two companies to work at Les Andelys and that a deflection of some of the troops to Andè or Courcelles would only have meant a weakening of the forces. Since the last motorcycle rider had dropped out shortly before, the commander went back to Saussay and gave orders for the battalion headquarters which had reached this point, to continue on as far as the bridge at Les Andelys and to see to it that the entire battalion retired to the east entrance of the city. As soon as they arrived, the company commanders were to report at the bridge.

As he passed through the city he saw that a number of motor vehicles were blocking the streets and that several streets could not be used being cluttered up by the wreckage of houses. Therefore the order was immediately given to explore the town and pick out several usable streets.

When the commander of the 41st Engineer Company reached the Seine at about 4:00 PM, the following picture of the situation presented itself:

A few groups of an infantry regiment had crossed on pneumatic rafts and a few boats which they had found there formed security on the far side of the river. At the moment they had no contact with the enemy. Rumors that hostile rifle troops were still in the houses proved to be false. The long spanned suspension bridge had been blown up by the French at the moment when the commander of the infantry battalion which had been hurried to the scene, was about to attempt to seize it by attack.

As to engineers, the 1st Company of an adjacent battalion was with the advance detachment. It had no bridge equipment at all at its disposal, but began the construction of ferries with pneumatic floats and such boats as they were able to find. On this ferry the first antitank cannon was carried across at about 5 PM and others soon followed it.

Since there was no use in counting on this speedy arrival of the bridge columns on account of the great difficulties in the way of moving the heavy vehicles over the roads, the 1st and 2nd Companies of the 41st Battalion could at first do nothing but build ferries with pneumatic floats and locally obtained material. The men of the battalion headquarters received the order to help gather material and to bring boats across from the enemy's side.

The order was immediately obtained from the commander of the advance detachment, who was in the vicinity of the bridge, that all vehicles should stop at the east entrance of Les Andelys and that temporarily only vehicles belonging to the engineers and to the bridge column could pass through the city. A traffic guard at the east entrance to the city had charge of the enforcement of this regulation which soon was confirmed by an order from the division commander.

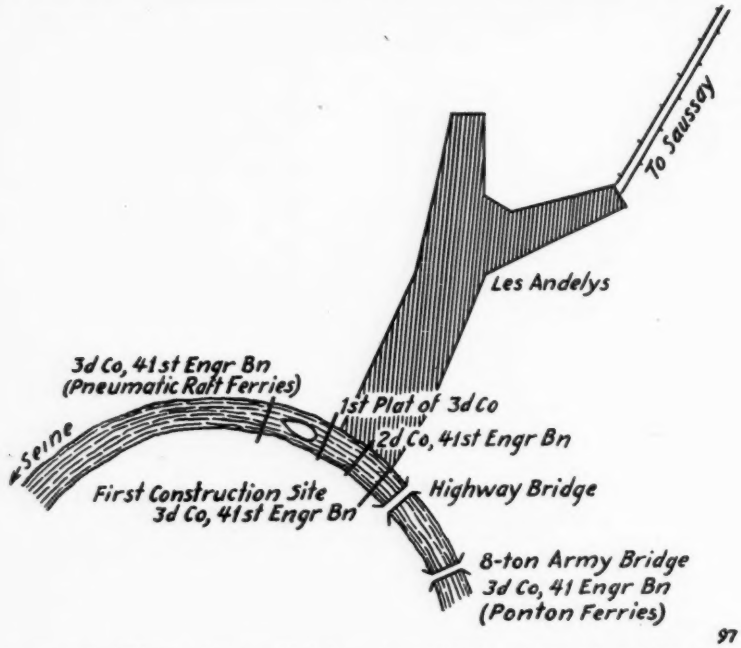
The following places to be used in the construction of floating sections were assigned to the company commanders of the 41st Engineer Battalion who arrived at about 4:45 PM, as well as the commander of the company from the neighboring battalion: for the men of the adjacent battalion—just to the south of the island; for the 3rd Company of the 41st Battalion in the vicinity of the wrecked bridge; for the 2nd Company of the 41st Battalion—between these two companies (see sketch).

When at about 5:30 PM, the 2nd and 3rd Companies of the 41st Battalion reached Les Andelys, the fire from a heavy battery began to fall at the site of the wrecked bridge. Therefore, the 3rd Company was moved to another place down stream from the island, which had already been explored with a view to using it as a bridge site, but was really not a very favorable location. It was only suitable for the crossing of foot troops.

About 6:30 PM and 7:30 PM, the 2nd and 3rd Companies, respectively, were able to begin ferrying troops over on emergency ferries. In the case of the latter company a great deal of time had been lost in gathering emergency material.

The commander of the adjacent battalion and at the same time the commander of the division, placed all portions of his battalion which were engaged at Les Andelys at the disposal of the commander of the 41st Engineer Battalion, and charged the latter with the

task of getting the reinforced regiment across the river and with the building of the bridge which had to be completed soon. All further orders were issued in closest cooperation with the commander of the infantry regiment who in the meantime had arrived at the river. Since their Command Posts were located close together, close cooperation was always assured. When, about midnight, the regimental staff crossed at the west shore, a liaison officer remained behind with the 41st Engineer Battalion who gave the orders concerning the transfer of portions of the regiment across the river, as they arrived.



Since a rough measurement of the river established its width at about 175 yards and only the three bridge columns which were present could be counted on, at least for some time, it was not possible to contemplate the construction of anything more than an eight-ton bridge. A suitable bridge site with a good approach on either side was found about 500 yards upstream from the wrecked bridge. The company from the neighboring battalion, after the arrival of the first of the vehicles of their bridge column, was taken from its ferrying operations and about 9:30 PM it began the work of constructing the bridge approaches on either side of the river.

The 2nd Company, parts of the 3rd Company as well as the one platoon of the neighboring battalion were engaged at the same time with the construction of four-ton floating sections from the material carried by the bridge column which had arrived in the meantime. At 10:15 PM, the first floating section was finished. The transfer across the river on all existing floating sections constructed with pneumatic floats and on sections built with emergency materials was continued. The tactical situation necessitated the continuation of the movement of troops across the river.

The enemy artillery fire stopped during the evening. It was learned later, that the battery had been taken by portions of an infantry regiment.

During the night, a company from another group was made available for use by the battalion. It took charge of the work of getting the pneumatic raft sections across the river. This expedited the construction of the floating sections with army bridge material.

Toward midnight, the job of ferrying the 1st battalion of an infantry regiment with its heaviest motor vehicles, was ended. The 2nd battalion followed immediately afterward at the crossing site downstream from the island.

During the night, the commander of the 41st Engineer Battalion was not informed of the whereabouts of his two bridge columns. Several times messengers were sent back to meet them. Constantly, officers of the battalion staff were out hunting for the bridge columns. It was not until 4:00 AM that they succeeded in finding bridge column No. 2 and in getting it up forward. The columns had been forced to halt for hours on 9 June outside the burning town of Poix, and even then had been able to move forward but slowly on account of their heavily loaded trucks. At various times, other trucks and cars had pushed their way into the line of the column affecting its unity. A few of the trucks were still missing. The division order that the bridge columns had precedence over all other arms, never reached them. After the arrival of bridge column No. 2, it was possible to carry on the ferrying operations at increased tempo. However, since bridge column No. 1 had not yet arrived and nothing could be learned of its whereabouts, there was no use thinking of beginning the construction of a bridge, although at about 5:00 AM, the construction of the approach ramps to the bridge was completed.

In the meantime, the 3rd Company of the 41st Engineer Battalion had been engaged in the construction of floating sections of the bridge about 500 yards upstream from the bridge site in order to avoid a congestion of bridge material. It also began ferrying operations in the early hours of the morning. The officer who had been left behind by the infantry handled the distribution of traffic to the two ferries with great skill. Strict regulation of traffic in Les Andelys, in which since the early hours of the morning field police had been engaged, preventing all traffic jams. The traffic control post at the east entrance to the city, which had to stop all vehicles not absolutely required, had a difficult job, and was occupied most of the time by an officer.

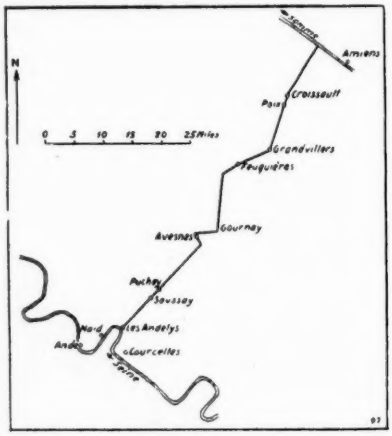
After the material from bridge column No. 2 (vehicles which had been separated from the rest of the column did not arrive until the afternoon) had all been used up, it was possible to give a few hours' rest to some of the platoons, as all the forces were not needed in the ferrying operations.

It was not until 9:00 AM that the first vehicles of bridge column No. 1 began to arrive. There were also a few ponton trucks missing which had broken away from the column during the march, so that there was not quite enough material for finishing the bridge. The commander of the column had left nothing undone to get all his trucks and cars to their destination. It was necessary to speed up the ferrying operations, employing even pneumatic floats for the construction of ferries.

In order to hasten the construction of the bridge, the division engineer made the 16-ton, double supported ferry at Muids available (the material belonging to a ponton platoon) and issued orders for this equipment to be brought to Les Andelys by the water route.

About 10:00 AM the commanders of two bridge columns appeared at about the same time and reported that their bridge columns were about to arrive. Under these circumstances, the commander of the 41st Engineer Battalion changed his mind with regard to obtaining the equipment from Muids, and sent orders to continue ferrying operations at that place.

By 12:30 the remaining necessary floating sections were finished with the material brought by the gradually arriving bridge column trucks. They could now be brought into place.



At 1:45 the bridge was completed. The first vehicles were called by telephone from the traffic post at the east entrance to Les Andelys. In order to avoid the occurrence of traffic jams resulting from two-way traffic, one way traffic had been established in the city. Hence, there occurred no tie-ups worth mentioning in the traffic over the bridge, not even when the bridge was made available for use by the division which was on the left.

Out of the material on hand, four reserve sections were constructed which must be regarded as the minimum allowable number (with twenty-four sections in use). A net barricade was also placed in position to catch drifting mines of which the French made extensive use elsewhere.

On 11 June at about 6:00 AM the bridge was attacked in a thick fog by enemy planes. The company which was engaged in the bridge service suffered several casualties. No damage was done to the bridge. All other air attacks were without result and made no material difference in the movement of troops across the river.

The building of the bridge at Les Andelys had to be accomplished in the midst of pursuit operations. It was necessary to do everything as fast as possible. Limits were placed on this, however, by the impossibility of getting the bridge columns forward fast enough. Therefore, in their well-meant efforts to advance, other branches must be willing to let engineers and their bridge equipment have the right of way when bridge construction is ahead.

Strategy—A Material Aspect

[An article by Lt. Col. H. J. Cooper, R.A.S.C., in *The Fighting Forces* (England) October 1942.]

A short definition of war was once given as being "a continuance of policy by other means"; the writer was Clausewitz. The means to which war was a supplement and for which it was a substitute were supposedly diplomatic and economic. Therefore in their frequent reviews of policy statesmen have to decide by what line of action they may best be able to encompass their ends. Whether war is possible, practicable or opportune; whether by its threat or by a display of its paraphernalia solidity may be given to an argument. But before the threat may be uttered or the paraphernalia flaunted, the prudent will see that the fighting services are so commanded, trained and equipped that victory is certain. In 1911 when the *Panther* appeared at Agadir the French had to make a rapid decision as to the policy they would adopt. The Prime Minister consulted the General Staff and asked if France in the event of war could positively count on victory. He received an evasive reply. Thus he adopted—indeed was forced to adopt—a policy of understanding with the Germans. The course of history of this country shows that statesmen have asked similar questions of their military advisers and have received similar replies.

A survey of campaigns during the past thousand years shows that of the factors governing war those which are normal are supreme; of those which remain the most important may be conveniently classed as political and administrative. It is a matter of extreme difficulty to forecast even the early stages of a campaign from either belligerent's point of view. The surprise effects of the administrative group will not be known, neither will it be understood how far their expectant results will be relied upon by the political group.

The appearance of archers at Crecy, the use of gunpowder by Mahomet II at the siege of Constantinople, the breech-loading rifle and mitrailleuse in 1870, the 17-inch howitzer in 1914, and the dive-bomber and miniature submarine today brought great advantages to their users. But surprises have not been confined to material technicalities. The organization of Wellington, the power of maneuver of Napoleon, the courage of the Russians in 1812, the marksmanship of the Boers, the recklessness of the Japanese in 1904, the amazing power of resistance in defense by the Turks in 1914-18 and the Russians today, and the moral stamina of the Greeks and Yugoslavs have powerfully affected their tactical operations. Against this background the present campaign may conveniently be set. It is already notable for the eclipse of the word "great" as applied to war and for the appearance of "global" and "spatial" as descriptive adjectives applied to warfare. It is even more noteworthy for the demonstration of what has for long been known, that nations of small industrial capacity and but poorly developed technical ability are completely at the mercy of neighbors better endowed and administratively more competent. It is to this administrative competence that attention may profitably be given. The administrative ability of a nation is closely related to the technical and inventive capacity of its individual members. A demand for a particular piece of apparatus by the expanding life of the civil population will create an organization to supply it, which in its turn will attract the inventive genius of those who are interested: the demand is then satisfied and in its turn will create other demands. The rate of production when not subject to legislative restriction is governed entirely by private financial considerations, and the care of the product is often of no moment. A similar process is to be traced in the demand for the provision and the use of those technical aids to fire and movement which are essential to the successful prosecution of modern war. An exception is at once seen in the limiting factors; they are imposed by the financial policy of Government.

Among the aids to individual fire and movement are aeroplanes, armored fighting vehicles, artillery, both trailer and self-propelled, the advanced methods of signalling, mechanical transport, chemical warfare equipment, and preserved food. There has for long been a tendency crystallized by war into a routine, to treat these aids and their components as pawns of which there is an inexhaustible supply and which can be supplied, used and discarded at the whim of commanders and their staffs. There has been no open recognition of the fact that a strategical plan can only be translated into tactical operations by equipment designed for the task in hand. It is insufficient to receive and approve the designs of field equipment, put them into production and then devise a tactical system for their use. If the problem is to defeat an enemy using aeroplanes both for reconnaissance and as vertical artillery, wielding considerable fire-power, displaying much ability in deployment, exhibiting meticulous care in maintenance and fertile resource in recovery and reclamation, then not only must our equipments be of a higher standard but the control of them must also be in every way superior. In Britain the assurance of an initial equality of standard of equipment with potential enemies can never be attained since financial policy not only, and perhaps prudently, precludes the accumulation of vast armaments, but does something much more effective; it emasculates research. British equipment during war is therefore much more in a state of flux than that of those nations who enter on war better prepared. This state of fluidity requires a greater and more expert measure of control than is commonly supposed. Research in control has also been lacking, and this is more surprising since it required only intellectual gifts and not money for its efficient practice.

It has been objected that the removal of the Master-General of the Ordnance from the Army Council has deprived that body of the benefit of technical advice in the formulation of war policy; but technical [1] advice is required upon questions which did not come within the scope of that officer. He was charged, *inter alia*, with the scientific development of war material, research, experiment, design, proof and inspection of articles as diverse as guns and buttons, with the administration of arms and branches and committees, but not with technicalities of strategical and tactical planning. His duties have been divided between the Ministry of Supply, the Deputy Chief of the Imperial General Staff, and to some extent between the Adjutant-General, the Military Secretary and the Director of Military Training. To appoint an officer with the powers of the late Master-General of Ordnance will not suffice, since advise is not only required by the General Staff as to the construction and maintenance of warlike apparatus and stores, but also with regard to their capabilities, limitations and use. This advise is better tendered by the users than by the designers, constructors and providers.

However much we dislike it, we must face up to the fact that strategy is subservient to supply. [2] It is not only necessary to ensure that a commander is provided with properly equipped formations in the field, but also to make certain that they are buttressed by an efficient system of supply, maintenance, recovery and repair. The knowledge, experience and flair required for the creation and working of this system is more often to be found among those whose military knowledge and experience are reinforced by an understanding of the technical limitations and capacities of their equipments than among those who are interested chiefly in and have been engrossed with their design and manufacture. Exact knowledge of the normal rates of wastage and of the possibilities and practicabilities of renewal of present-day military apparatus is not normally part of the stock-in-trade of the General Staff officer and of the aspirants to General Staff appointments; nor is the facility for integrating the multitudinous variables encountered on this side of Staff duties a normal part of their mental equipment.

The ancient routine of having concentrated an army close to the enemy's main forces without interference and by su-

[1] The word "technical" in the Army is most frequently used in its narrower sense of pertaining to the mechanical arts and applied science. It is here used in its wider sense of being characteristic of a particular art or profession—that of soldiering.

[2] Supply is not used to denote the process of providing food and fuel, but to embrace the functions of placing at a commander's disposal, in proper quantities, at the proper place and at the proper time, all that he requires for the maintenance of his force.

perior mobility and divination to have obtained a result by nightfall can no longer be followed. Nor can the more modern technique of "biting and holding"—the slogan of the late Lord Rawlinson—be practiced today with the certainty which was achieved by energetic commanders in the 1914-18 campaign. In the past it was an easy matter for a commander to have an adequate knowledge of his officers, men and animals in order to assess their ability to perform the tasks which he was about to set them. Offensives today are not mounted in this manner. General Wavell was at one time charged with the control of five major campaigns. The Minister of Defense may at any one time have plans for ten or a dozen operations under review. The advise upon which he relies for their construction must be technically perfect. The organization responsible for this advise has lately been the subject of a White Paper. It has also recently been advocated that there should be a combined Great General Staff charged with the duty of directing the strategic plans of the Imperial Forces. The direction of successful war requires officers of the General Staff to have an exact understanding of the capabilities of the apparatus of their profession, of the corresponding apparatus of the enemy and of the effect of offensive action upon both.

The principal duty of a commander is to make decisions: these decisions he bases upon appreciations, which in their turn are dependent for their accuracy upon knowledge of the capabilities of the enemy, who will attempt to interfere with them. If these capabilities are not known, then the commander cannot know if his plan is, in fact, capable of achieving the defeat of the enemy, for without this knowledge war is reduced to the level of the gaming table. To take a risk knowing the capacity of the enemy is to make a bid for victory; to take risks without this knowledge is just to gamble. The art of strategy is now grafted more firmly upon the twin stems of economics and administration than at any period of history, a fact which has been plain to the Germans since the failure of their assault in March, 1918.

The military might of a nation is not by the stock of *matériel de guerre* but by the rapidity with which a nation can turn from the arts of peace to the business of war, and by their power successfully to pursue it. The proper use of this military might is dependent in the first instance upon the ability of the combined civil and military administrative services to place the equipments where varying strategical commitments require them. A British Metropolitan or Imperial Army must embark and disembark before it starts to fight or it cannot start at all. In the past the safety of the operations of embarkation and disembarkation has been assured by the Navy, who kept the sea alleyway continuously clear of the enemy. An alleyway free from surface and underwater craft is no longer adequate. A tunnel must be provided through which the embarked forces may proceed undisturbed to their landing-place. The provision of this tunnel is the affair of the R.A.F., and leaks are tamped by the ground and floating defenses. The tunnel provided for the process of disembarkation must be extended to the theater of operations by some form of shamiana, the fabric being formed by the R.A.F., the leaks being made good by the Army. The strategical doctrine upon which operations of this class are based must plainly be controlled by an inter-service body. The form of this organization will not be debated in this essay; it is to some of the administrative implications of such control that attention will be directed.

Administrative duties in field operations may conveniently be divided into eight segments: clothing, accommodation, equipping, feeding, maintaining, reclaiming, repairing and recuperating. They are the same for the enemy as for ourselves. The importance of the enemy's arrangements composing these segments increases with the duration of the campaign. For it is the future capacity of the enemy which a commander must compare with his own: it is not the enemy situation today upon which he will base his plan for tomorrow. After the clearance of the Axis forces from Cyrenaica in January, 1942, the enemy commander resorted to one of the most ancient ruses of war—surprise. His power of reclaiming and repairing the equipment of his force exceeded the expectations of the Middle East Commander and gave rise to administrative surprise which turned the balance. It is of vital interest that these manifestations of the principle of surprise should be carefully examined. If we consider the administrative situation of the enemy at any moment it will at this instant be found, to borrow a metaphor from applied mechanics, to have an instantaneous center: a factor which at that moment will be preponderant. The capacity of the enemy to wage war from his existing dispositions will at that time be founded on this factor: the opposing commander must equate this future capacity to his own.

The enemy is a live and variable factor, possessing all the capabilities for action that time and space allow him. When endeavoring to ascertain what administrative surprises he may spring it is important to discover what is possible; whether it is reasonable or unreasonable is of no concern. Deception is an indispensable corollary of surprise; it is therefore important to be certain that a probable intention shall be possible.

Since the form of surprise now being considered has a material basis the apparatus, the places of its manufacture and of storage, the methods of its transport and sites of its accumulation cannot be concealed from observation. The past economic situation of the enemy, brought up to date by the latest information is a sound basis for the construction of his future capacity. The collection of this intelligence is a part of the duty of the Intelligence organization. The process of collection has for long been going on; whether it started early enough or was prosecuted sufficiently thoroughly may be debatable. It is certain that the application of the lessons which should have emerged from the integration of the results of the collection has been tardy. Reference has already been made to the doctrine of rapidity of transition from the arts of peace to the business of war: the doctrine of active and intelligent guidance must now receive attention. [3] The processes and rates of speed of production of warlike stores are today a responsibility of the Ministry of Supply. Similarly, the Ministry of Economic Warfare is responsible for the collection of intelligence concerning the power of the enemy to produce warlike apparatus. The increasing speed of existence and the consequent complexity of warlike organization are responsible for this delegation, which in its turn requires at the center of affairs some greater and more exact measure of control.

What, it will at once be asked, is the practical application of this analysis today? The battle zone is now so wide in extent that the "void of the battlefield" has become the void of Europe. The administrative Intelligence service is vastly expanded and the intelligence it provides is of greater volume and greater importance. Allow it to be supposed that a proper estimate has been made of the capabilities of the enemy six months ago to produce surface and underwater craft, aircraft of all kinds, guns and small arms of all calibers, tanks of all weights and transport of all capacities. It is thus possible to know what he has today and what he will have in x months' time when the opposing commander has marshalled his forces for the decisive blow. Knowing the proportions in which this armament is available, the size and types of offensive which he can mount can be determined; knowing the locations of the armaments, the possible theater of operations will at once be seen. If these facts have been properly deduced then strategic surprise is impossible. The rates of wastage of men and equipment in battle are unknown; reliable data will not be available. The possible phases of battle will be those of complete, semi or partial collapse. If either of the two last only is achieved final defeat will be postponed; the power of recovery will then assume supreme importance. In this power today resides one of the chief possibilities of surprise. The conveyance of reserves and the repair of vehicles and apparatus are the chief factors and they have a common basis—transport. Security against this form of surprise can best be ensured by conservation of transport—an all-embracing term covering its design, production, issue, storage, use, maintenance and repair.

[3] "To organize producers and merchants as a powerful army subjected to an active and intelligent guidance so as to secure an industrial victory by order and unity of efforts" was the aim of Colbert in the days of Louis XIV.

Tactics of Combat for Inhabited Places

[Translated at the Command and General Staff School, Fort Leavenworth, Kansas, from a Russian article by Major P. Slesarev, Soviet Army, in *Krasnaya Zvezda* 10 December 1942.]

Fighting in the regions of Velikiye Luki and Rzhev is characterized by stubbornness and violence. In the final analysis, it reduces to a struggle for control of separate inhabited places or of groups of them. Many of these settlements had previously been transformed into powerful centers of resistance by the Fascists.

The Germans hold onto inhabited places especially tenaciously for a variety of reasons. First of all, in a village it is easier to organize defense, to dispose the fire elements and personnel, and to store munitions, fuel, and provisions. Moreover, as also in the preceding year, the German troops prove to be unprepared for action in woods and fields during the cold season. Captured Germans, still clothed in summer uniform, unanimously declare that in their forces there are as yet no units equipped for winter. Thus not only tactical considerations, but also climatic

conditions force the Germans to confine themselves to villages and farmsteads.

Upon advancing, our units quickly learn how to drive the Germans out of the inhabited places. In the course of the fighting, definite methods have been worked out which have the greatest effect in the struggle for the villages. Let us study the basic conditions for success, considering such stages of the battle as the preparation for attack, the attack, and the consolidation of its results.

Before the start of combat for the inhabited point, careful reconnaissance of the forward edge and depth of defense of the enemy must be carried out. There is usually a fairly dense network of permanent log and earth fortifications located on the outer edge of the German defense. They cover the intervals between neighboring settlements which are adapted to all-around defense. The number of dugouts on the forward edge is large. As many as 25 to 28 of them have been counted near a small outer defense village. In order to neutralize all machine-gun nests and engineering constructions of the enemy in the direction of the proposed attack, our reconnaissance at times penetrated thirty to thirty-five kilometers (fifteen to eighteen miles) in the rear of the Germans. They marked all permanent control points on a map, and likewise the roads which could be used for infantry and vehicular transport.

In the course of painstaking study of the enemy's fire system, the reconnaissance parties uncovered one important tactical detail. Building their defense in the fall, the Germans as a rule did not erect permanent fortifications in swampy areas and on the necks of land between lakes. Our attack units therefore made some use of this fact for concealed approach to the rear of the fortified inhabited places. Prolonged and systematic reconnaissance of the hostile defense made possible the surprise encirclement and speedy destruction of a series of control points. But what is to be done in cases where the conditions of the region do not make it possible to break through to the enemy's rear unobserved?

Generally speaking, there are two types of attacks on inhabited places: frontal attack, and outflanking movement on one or both sides. Frontal attack, proceeding along the shortest route, is very inviting. But combat experience demonstrates just once more that the shortest way does not always lead to success. The opposite is usually true. Those units which attacked the settlements frontally suffered losses and retreated. Thus, for four days a certain unit undertook a series of frontal attacks, and all were repulsed. But no sooner did they take advantage of hollows and woods to outflank the enemy than the village was taken.

In by far the greater number of cases it is more expedient to take the inhabited places from the flanks, although it sometimes requires prolonged preparation. Let us relate the experience of a certain unit of all arms. In the first stage of the attack our artillery crushed the registered log and earth fortifications covering one or other of the settlements. In this network of dugouts the artillery cut veritable corridors. At once a stream of our tanks and ski troopers rushed in that direction. The artillery shifted fire to the hostile batteries and observation posts. At the same time the antitank guns passed through the corridors behind the attacking echelons. With their fire they protected the attacking tanks and infantry from the rear, taking care of the revived machine-gun nests of the enemy.

As soon as the units attacking through the corridors turned to meet each other, the Germans usually hastened to withdraw to the next village. This moment is particularly advantageous for the destruction of enemy personnel and the capture of matériel. The reason is that the Germans, retreating under the threat of encirclement, often do not succeed in securing their flanks, and do not carry out reconnaissance. They ordinarily retreat massed in close column, and at this moment they are most vulnerable to attack.

One of our tank companies, attacking a battalion of Germans by surprise at the time of its hurried retreat, almost completely wiped it out by fire and tank treads. By attentively following the course of battle, it is always possible to detect the start of the enemy's retreat, and if even only a small group of tanks and automatic riflemen on skis is available, it can deal the retreating Germans a crushing blow.

How opportune the enveloping of one or both flanks of the enemy may be is evidenced by the following incident. Operating in a similar way, units of a certain force of combined arms captured thirteen inhabited places and advanced twelve kilometers (seven miles) in two days of ordinary combat. At the same time they killed more than 1,200 Hitlerites and seized 28 guns, six tanks, and large numbers of regular and automatic rifles.

However, the region sometimes abounds in lakes and unfrozen swamps, which hinder flanking maneuvers. Then the situation necessitates recourse to frontal attack. Here it is important that the attack be preceded by an adequate artillery bombardment of all registered objectives. It is most advantageous to time the attack by tank and infantry for the approach of darkness or snowfalls and storms. Such a bold night attack in the region of the Velikiye Luki-Novosokolniki railway made possible the capture of several fortified villages which up to then had been considered impregnable.

Organizing active day and night movements and boldly leaving individual log and earth fortifications of the enemy blockaded in our rear, it is possible to fight the Germans out of one village after another. But here the commander must know not only how to strike down an inhabited place, but also how to consolidate it quickly behind him. The matter is occasionally quite different in practice: some villages have changed hands many times.

What is usually the cause of such a phenomenon? Basically this, that the units, after reaching the inhabited place, halt their activity and begin to re-form. For those units which cleared the village of the foe, such a pause is valid. But at this very time the commander of the unit should immediately advance his reserves. If he deliberately withholds his reserves in needless apprehension as to the flanks, he thereby gives the initiative to the enemy.

Consequently, upon taking a village the commander must organize here an all around defense with the personnel of the units having sustained the burden of combat. At this time the reserves must pursue the retreating enemy continuously. With such alternation of activity by the units the enemy will be thrown back so far from the inhabited place that surprise counterattacks can not be made.

Artillery Support for Tanks

[From an article by Captain W. R. Young, R.A., in *The Army Quarterly* (London) November 1942.]

The deadliness of the antitank gun calls for the study of the best means of giving our tanks support when they are faced with its menace. Hence the Support Group in an armored division. But this body is found to be more self-supporting than a support for tanks. Its artillery cannot keep up with a successful tank thrust and its carriers are extremely vulnerable to the antitank gun. New methods of support are therefore being sought. One method is the use of aircraft as close support artillery. This proved very successful in the German attacks in France, but it has grave defects. These are:—

a. The delay in coming into action is always considerable since the aircraft have to be summoned from the ground.

b. In face of strong fighter or anti-aircraft opposition the aircraft will probably not arrive at all.

c. The support afforded must be spasmodic and its effectiveness suffers from the law of diminishing returns.

That the Germans are not satisfied with this method of support for armored formations is shown by their introduction of the self-propelled "assault" gun.

The arguments against the self-propelled gun—the field-gun mounted on a tank chassis—are that:—

a. If it is using indirect fire it is less efficient than a field-gun on the ground.

b. If its fire is direct it is no match for the opposing gun on the ground, since it presents a larger and more conspicuous target, or for the tank since its armor is inferior.

Nevertheless the field-gun, lightly armored and propelling itself on tracks, has capabilities and potentialities of development. It can move with reasonable safety over country which has not been mopped up—as, indeed, can the Bren carrier. But the field-gun can engage its target with indirect fire and also at longer range than the Bren. In favorable country the self-propelled gun could take up a position in the open at 3,000 yards range from the enemy's antitank gun and have the better of a duel over open sights. But this will be the exception in most theaters of war. Indirect fire, therefore, will be its more usual method of action. In planning the tactics for this weapon we must bear in mind that its quarry is not the enemy's tanks, but his antitank guns. The tanks can be dealt with by the appropriate branches of the armored division. The situation with which the artillery Forward Observing Officer (F.O.O.) of such a gun will be faced will be precisely the same as that which confronts the F.O.O. who is supporting an infantry attack. A strong point is holding up the advance. The artillery must destroy or neutralize it. The fact that the enemy may at any

moment launch a counterattack with tanks does not concern him directly. His troop, of course, will engage these tanks if they attempt to interfere with its task. Meanwhile the F.O.O. must lay out his lines of fire on the strong point. In this task the F.O.O. of the troop of self-propelled guns, the Royal Horse Artillery of today, will have a great advantage over his field artillery counterpart. Since the tanks which he is supporting will have been withdrawn out of range of the strong point, there will be no need for the F.O.O. to take elaborate safety precautions—to start well over and creep back to the target. He can slap his first round on the ground by "bow and arrow" methods and make his corrections boldly. And if the tank squadron which he is supporting decides to make a dash while the shelling is still going on they will suffer no great harm from their supporting troop, since it will be using HE (high explosive) shells with instantaneous fuzes.

Anybody who dares to question suggestions for increasing the mobility of our equipments is liable to be regarded as a reactionary. But the case for the more mobile gun has been obscured by false advocacy and much of it is based on neglect of a fundamental principle, which is that *the weapon of the artillery is not the gun but the shell.* It is due to this neglect that we have heard a good deal of nonsense about aircraft being superior to artillery, presumably because aircraft can travel 250 miles an hour whereas the gun can only do 20. The shell, however, does more than 950 miles an hour. In our artillery training too, we are liable to make the same error; and in our very laudable zeal for speeding up the procedure of *coming into action* we may tend to forget the importance of always having guns *in action.* Given good OP (observation post) work and good gun drill, the velocity of the shell will supply the speed in engaging the target.

An attack by army tanks, even if carried out at "fair tank pace," will not disappear into the blue beyond the range of the supporting artillery. Army tanks are still infantry tanks, and the depth of their advance is limited ultimately by the ability of the infantry to catch up. Here then is a clear case where the artillery can be more useful by being in action rather than by moving into action. From positions about 3,000 yards behind our start line, field guns can cover an advance of five or six miles. They need not, therefore, move for at least three hours of an infantry attack even in the most favorable circumstances. On the other hand they will in the course of the three hours fire off a large quantity of ammunition; and this should be expended to the best advantage. Observed fire is probably the ideal form of artillery support, but this cannot be supplied in the early stages of the attack since the enemy's antitank guns will almost certainly be defiladed from the front and, in any event, will not disclose their positions before the attack is launched. Since these guns are easy to conceal and to camouflage, it is unlikely that we shall have sufficient information beforehand, from ground or air observation, on which to base a timed program of concentrations. The book solution for these conditions is the barrage, since that searches the whole area. But we are considering a tank, not an infantry attack; and that makes a great difference.

The easiest position to defend against infantry attack is a *glacis*—the even or concave slope where the attackers are under small arms fire for the whole of their advance. But this advantage of the defense can be overcome by the creeping barrage with the infantry following close behind it. It can also be overcome by bullet-proof vehicles. Tanks, in fact, possess a big tactical advantage in attacking up a *glacis* and require no formal artillery support since it is improbable that antitank guns will be sited on the forward slope. Artillery, however, must be ready even for this unlikely eventuality, which will give them a chance of directing observed fire on to the targets. It is desirable, therefore, that the artillery should be not only in action but also well registered. But no case can be made out for a timed artillery barrage leading tanks into action up a forward slope. If a barrage is demanded it can be provided by machine guns which can neutralize all the antitank weapons and will do no harm if they hit our tanks. On the other hand a *reverse* slope provides the ideal position for the siting of antitank guns. It is defiladed from ground machine-gun fire and is invisible to the tanks until they have surmounted the crest. If that crest is at all sharp, the tank in crossing it will have its own weapons pointing up in the air, its soft belly exposed, and its outline nicely silhouetted against the sky. But even in less perfect conditions the antitank gunner will be happy on the reverse slope. It is, therefore, when our tanks are preparing to surmount a crest and advance down the reverse slope that they will require all the support which the other arms can give them. Now, we cannot ask infantry to move up to the crest and fire down the other side. Their heads would be on the skyline and they would come off worst in a small arms duel. And their carriers provide no solution since they are more vulnerable to antitank guns and even antitank rifles than the tanks themselves. Infantry can, however, help by bringing up their mortars and firing over the crest; but such action must wait till the near side has been mopped up and the flanks have been neutralized. But the artillery can help all the time—both before and during the attack.

Since the enemy's dispositions are indefinite our fire must be equally indefinite. The opening salvo must be widely-dispersed and the subsequent program should allow for the covering of the whole of the suspected area by means of sweeping and searching. This program does not call for an excessive expenditure of ammunition since the targets will be static, not fleeting. A slow rate of fire with no two rounds directed at the same spot should, with reasonable luck, succeed in knocking out some of the antitank defenses—guns or crews. But, of course, not all of them; so we must continue our study of the problem of support. The value of a fire plan is seen not in the preliminary bombardment but in the support which covers the attacking troops right up to the enemy's position. In the conditions visualized, where the attack is to be down a reverse slope, where direct fire or even observation of indirect fire cannot be depended on, and where the enemy's dispositions are unknown, a timed creeping barrage adjusted to tank pace might be the answer. But again we must remember that we are planning to support tanks and tanks possess advantages other than the ability to move more quickly than infantry. They are also splinter-proof, whereas antitank guns are not. Therefore if we arrange our fire in such a way that, while the splinters will be scattered over a wide front, the shells themselves will all fall along clearly defined *lines parallel to the axis of advance,* our tanks will be able to go forward *through* the barrage by sticking to the lanes between the lines. This "Line-ahead" barrage will be more than a series of flanking barrages since the front of the advance will also be fairly effectively covered by flying splinters. The sequence of events might be as follows:—

> After the preliminary bombardment has continued till the tanks are just short of the crest, the supporting troops of artillery will put down their line-ahead barrages. The tank commanders can then, from a hull-down position or from the ground, have a look at these and check the bearing which will take them down the lanes. The standing barrages will be there like a kind of avenue to help them keep their direction. The near edge of the barrages need not be closer than 400 or 500 yards to the crest and the mean fall of the shells can be spaced at 100 yards intervals; so that a series of troop barrages will cover an advance of 700 or 800 yards beyond the crest. By the time this distance has been crossed, the F.O.O's should be on the crest ready for observed fire. So also should machine guns.

According to present theory the question of artillery support for tanks in open country will seldom arise. In such country, armored units will make use of their mobility in wide encircling movements which will by-pass the strongly defended front in order to come in from the rear. Yet in the Libyan desert the fighting has been likened to naval operations in which the opposing fleets seek to destroy each other. We can already sense a clash of ideas here, but we need not presume to suggest a choice or a compromise since we are primarily studying support. Battle experience is the best teacher anyway. Tanks do, however, require support in enclosed country where sweeping movements are impracticable; but no stereotyped methods can be laid down. Nevertheless good general rules for the artillery are always to have some guns in action and to bombard buildings, woods, and indeed all cover as a matter of principle. F.O.O's should be well forward and should put down a few shells on any "likely" locality which the tanks are approaching. And tanks should boldly approach any locality where our shells are falling. In course of time intercommunication between the arms will be greatly developed; but we need not wait for this. As has been said before, the tank has little to fear from instantaneous fuzes, and bold following up will often save it from the antitank gun whose crew's attention has been distracted by the arrival of a couple of 25-pounder shells. It is, indeed, probable that this characteristic of the tank: viz., its invulnerability to non-armor-piercing projectiles, will enable us to dispense with all elaborate types of fire plan. Tanks can advance *through* a machine-gun barrage; they could equally well do so through a shrapnel barrage. Why not, then, through an instantaneous fuze HE barrage?

Another responsibility which will fall on the artillery in its support of army tanks will be the neutralization of antitank guns on the flanks of the main advance. In this task there will be opportunities for economizing in ammunition by the use of smoke shell. This will ef-

fectively neutralize antitank guns since they are open-sight weapons which are of little use unless they can be laid on their target. Firing them on fixed lines is not a practical proposition. Particular care, however, must be taken of the direction of the wind since tanks hate to advance through smoke—they are blind enough as it is—and they have a horror of being silhouetted against a drifting smoke screen. Except in these points, the neutralizing of flanks for a tank advance provides no specific problems. Nor is any specific problem presented when we find tanks held up by an obstacle—minefield, scarped embankment, or river. Engineers, infantry, and artillery must come into action here, and their operation will be of an old-fashioned type.

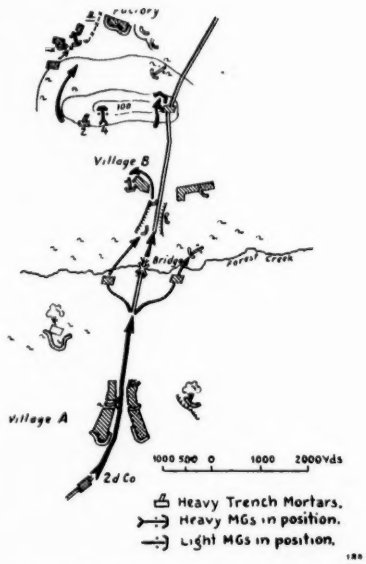
Attack By An Infantry Company With Tanks

[Translated at the Command and General Staff School, Fort Leavenworth, Kansas, from the German in *Militär-Wochenblatt.*]

Situation: The enemy has been pushed back a distance of 100 kilometers (about 60 miles) by means of daily attacks for five days.

On the last day air reconnaissance recognizes field fortifications on both sides of the highway running north and south in villages "A" and "B" and in the factory area.

Riding the tanks of a tank regiment, the 2nd Company, reinforced by a heavy machine-gun platoon and a heavy trench mortar group, is the first company of the 1st Battalion to reach the south side of the village.



The main body of the battalion is following close behind.

The mission of the 1st Battalion is to take the factory area, attacking the enemy along the north and south highway.

Condition of the forces: Fighting day and night for five days.

Weather: 41 degrees Fahrenheit, sunshine, good visibility, considerable ice.

Air Situation: Our own air force during the attacks, superior so far.

An attack with the tanks requires very special combat knowledge on the part of the commanders of the infantry company, quick recognition of the situation which is constantly changing, and a willingness to rely on the tanks for support in a fearless attack.

The combat of the 2nd Company consists of these situations which are typical of this type of fighting. Each of them produces surprises for the infantry commander and brings him face to face with new command tasks.

An engagement of this kind with tanks is difficult for the instructor to present as an exercise. In combat firing it is also difficult to attain the intended objective. For this reason the exercise is best presented in the form of a lesson in which the most essential and peculiar points of tank combat are thoroughly discussed by means of examples. The effect of the tank attack on the morale of both friend and foe must be considered.

The tanks are rolling forward over the north and south highway, the 2nd Company riding on top of them. No one is riding on the leading tanks as they always draw the heaviest fire. Because of the tanks the enemy has crawled into his holes.

Stukas are watching over the attack. They dive and shower bombs on centers of resistance on the right and left flanks, 800 to 1,000 meters from the attacking infantry. As their next target they choose the north entrance to village "A" and in this way do an excellent job of substituting for the artillery.

In the center of the village shots suddenly come from all sides. Resistance flares up with great violence. The 2nd Company leaps down from the tanks. With one platoon on the right and another on the left of the highway they advance, giving the enemy all their weapons are capable of and bearing down on the houses with a yell. The tanks liquidate the centers of resistance with their guns at short range. Unified command of the platoons or groups is out of the question. Here and there is a group of rapidly firing infantrymen running from house to house behind their officers and NCO's. In this way the village is in German hands in a quarter hour's time. The enemy's losses are especially high; the wounds caused by the tank fire are severe.

The 2nd Company rushes into the fight with the speed of lightning. There is no time for deliberation. They have to tear into the worst and nearest of the centers of resistance and as soon as that is cleaned up go after the next one. It is important that young company commanders learn that when attacking with tanks one gets into the fight much more quickly than in any other manner, but on the other hand the engagement itself is usually of shorter duration. Leading is impossible except by example since on account of the tanks, the Stukas, and the fighting, there is so great a noise that the voice can no longer be heard. Also it is necessary first to get used to the astonishingly great disorder resulting from the rapidly changing situation.

After this victory the morale of the company is greatly increased. They again mount their tanks and continue with the original organization.

Just as the first of the tanks reaches the bridge which crosses a creek running through the woods, the bridge is blown up. Machine-gun and rifle fire is directed at the tanks from the opposite side. The latter immediately deploy to the right and left and open fire. They lay down a heavy fire on areas of the terrain when targets cannot immediately be discovered. They attain consistent success in their operations.

The company has again dismounted from the tanks and takes up the fight, moving against the enemy in the low portion of the highway after wading through the creek with the water up to their waists.

On account of the closeness of the terrain the fire of the tanks cannot reach the low part of the highway and the enemy is dug in here, well concealed and disposed in depth. His defense is strong and dangerous.

Again there is close action. Every one fires on the move. It is not possible to take up a position. The low portion of the highway is cleaned up properly. The men keep running onto small groups of hostile machine-gun and rifle troops concealed in sheltered places and these are taken care of by our own machine guns and machine pistols, and hand grenades. In this way the highway is cleaned out.

In village "B" resistance is again encountered. Again it is crushed in house to house fighting.

After the initial victory the 2nd Company is set to cooperate fully with the tanks. Along the creek the situation changes rapidly and in an unforeseen manner. The attack along the low portion of the highway, once begun, cannot be stopped just because the tanks are not able to follow. The company is left to itself entirely. Naturally the losses here are greater than in village "A".

The company commander makes use of the cover afforded by Hill 100 for reorganizing his forces. On account of the casualties the men are hurriedly reorganized in two platoons. It is very important that the commanders have a clear idea of the objectives to be attained. At the end of an hour's time the tanks arrive. Detailed plans are now made for operations to be directed against the enemy in the factory. The problem involves the two factors, fire and movement. Shall the tanks attack ahead of the company, at the same time as the company, or first provide fire protection for the company?

The 2nd Company attacks, passing to the right and left of Hill 100. Tanks, heavy machine-gun platoon, and heavy trench mortar group support the attack with their fire. Because the infantry troops attack first, the enemy is forced to engage in fire combat and consequently to reveal itself. As a result of this the tanks are provided with targets. Hence, during the course of the attack they are able to see where they must help and can thus assist the rifle company in those places where they are about to get winded.

The platoon on the right has been stopped by flanking fire from machine guns. After the left platoon has made good gains the tanks help the platoon on the right to advance. The tanks must not go on alone at this time but as a matter of fact are obliged to shove the infantry company ahead of them again, furnishing them support, since their combat ability has been considerably reduced as a result of the fighting that has already taken place. Other tanks take care of the breakthrough.

Lessons:

1. Riding on top of tanks against a demoralized foe is good practice. But the leading tanks should have no men on them. There should be plenty of ammunition and food.

2. The influence of the battalion commander is smaller. Hence, heavy weapons should often be placed under the orders of the rifle troops at the very outset.

3. Hesitation at the beginning of the action costs casualties. The troops must leap down from the tanks and go after the enemy immediately, regardless of disorder.

4. Casualties must not impede the work of the command during the attack. The troops must be reorganized and must continue with the fight. In this way losses will be less than when there is a break in the operations.

5. The 2nd Company had three engagements of this kind in one day. It always bore the main brunt of the battle. The individual men themselves were of decisive importance in close action. Their training in close action bore fruit.

Combat In a Ravine

[Translated at the Command and General Staff School, Fort Leavenworth, Kansas, from a Russian article by Major R. Bezhanyan, Soviet Army, in *Krasnaya Zvezda* 11 December 1942.]

The complex relief of mountainous regions makes the use of artillery at high altitudes difficult and sometimes even impossible. Furthermore, the narrow ravines, the steep ascents, and the absence of roads frequently do not permit action by large forces. Consequently the combat work of small units well-equipped with infantry weapons is of special importance. Thus, for example, a company cut off from other units may accomplish fairly significant missions. Let us examine one such battle.

The enemy was occupying a ravine through which ran a trail leading to a pass. According to reconnaissance reports the Germans had about one company in the ravine, supported by a heavy machine gun, several light machine guns, and mortars. A considerable number of snipers was also observed. It was discovered that the Germans had disposed the greater part of their fire elements on the steep slopes of both sides of the ravine.

It was the task of our company, reinforced with battalion mortars, to dislodge the enemy from the ravine and come out into the pass. The action was supported by a battery of mountain artillery and mortars. Careful study of the locality and the system of hostile fire showed that a day attack was inexpedient, the more so as the Germans were covering the entire ravine with the aiding of flanking firing points. Therefore the company began to attack at night after artillery bombardment of the enemy's positions.

The enemy did not display particular activity. Moving in, our company had by daybreak occupied two small elevations, from which the combat outposts of the Germans had been ousted. The company was ordered to consolidate here. The ground was exceptionally hard, so the troops used large rocks for the erection of cover. During the day both sides carried out skirmishes in which mortars were used, the enemy employing his in roving fashion.

As soon as darkness fell, the company again began to attack. This time the Germans showed very stubborn resistance. The machine-gun nests disposed on the flanks were especially troublesome. It was a clear, moonlit night. In addition, hostile rockets rose almost continuously. This enabled the Germans to exert aimed fire at short distances.

The company made scarcely any advance all night. It became clear that, in order to achieve any success, it was necessary to silence the flanking firing points of the enemy and especially the heavy machine gun, which had caused a great deal of damage. Three men offered to destroy this machine gun which was restricting the movements of the company. During the day the soldiers carefully studied the terrain, developed a precise plan of action, and were given thorough instructions. In order to help the daredevils in the completion of their task, it was decided to feint a frontal attack at the same time. These operations were started as soon as the moon had set behind the heights and it had become quite dark in the ravine.

The three soldiers began to make their way up the steep cliff. At times the enemy, covering the approaches to the heavy machine gun, fired at random at the men, and they had to bide their time. But at last they had stolen up almost to the enemy; then each threw two hand grenades. Machine gun and crew were destroyed. Down below in the ravine a violent battle was raging, in which both sides were using hand grenades extensively.

This night the company again moved forward some distance, when suddenly the situation changed. The enemy, in an endeavor to maintain possession of the ravine, brought up fresh forces, approximately a battalion. Our unit initiated a counter-maneuver and the center of combat shifted to the right of the company of which we are speaking. Finally the Germans were forced to withdraw from the ravine. (Here the description of the action ends abruptly. This is a characteristic of both Russian and German military articles of this nature. Ed.)

This three-day battle enabled us to draw a series of practical conclusions. First of all it showed that extensive use of night operations is feasible in mountain areas. Occupying positions useful for defense, the enemy holds all the approaches under dense fire during daylight, but at night the effectiveness of his fire is sharply reduced.

The Germans mined the ravine. Our troops discovered this and moved along off the trail, which of course increased the difficulties. Hence one conclusion: in any unit it is necessary to have sappers, who explore the area, especially the roads and paths, and remove the mines from them. It is true that there was still another reason for avoiding the trail: German snipers had adjusted fire on all the paths beforehand. At times these snipers fired on the trail from long range even when there was nobody on it. Our troops saw tracer bullets strike the rocks where not a single soldier stood. Evidently fire was being adjusted from a new line. Our troops used every means to detect and destroy the enemy snipers, and at the same time they endeavored to expedite the removal of the wounded from under fire.

From their positions the Germans were able to study the combat formation of the company. They apparently discovered where our wire communications ran, and tried to knock them out with mortar fire. They succeeded three times. Then our communications men stretched a double line. It started at a point about 300 to 400 meters (330 to 440 yards) from the command post and ran to it from the rear in a different direction. If one line were cut, the second functioned, and meanwhile the communications men repaired the damage. Such a method secured steadier communications.

In very difficult conditions it was necessary to use runners. The German snipers were on the watch for and fired upon

them. For this reason, in daytime special fire security had to be developed for the runners. As soon as it was necessary to send a soldier with a report to the headquarters of the unit, intensive mortar fire was opened on those machine-gun nests which particularly hindered movement to the rear. The places where the most active German snipers had been found were especially covered. Two runners were always sent with the report so that if one were disabled the other could still deliver it.

This battle also emphasized how important the correct selection of observation posts is. In the first period of the company's attack our mortar men aimed without seeing the target, and it was difficult to judge the results of fire. Later an observation post for the mortar unit was established on a hill near the firing position of a heavy machine gun. This at once heightened the effectiveness of the mortar fire, which inflicted considerable losses on the enemy.

Several tactical peculiarities of the fighting in the ravine may, it seems to us, be summed up as follows. The enemy tries to dispose his fire elements so that they will be on the flanks of the attack. Purposely allowing the latter to advance somewhat in depth, the enemy hopes to get it into a pocket of fire. For this reason the destruction of hostile machine-gun nests located on the flanks, and usually well-concealed, is a very important task.

Finally, it was demonstrated once again that the activities of small detachments and sometimes of even a few valiant men play a great role in mountain warfare. It is, however, necessary that the units be well trained for operations in the mountains and be outfitted with special equipment (grapnels, alpenstocks, ropes, etc.) which is of inestimable value. Moreover, the soldier must not carry any superfluous equipment which might hamper his movements. Gun, ammunition, and spade: that is all the soldier needs during the attack in the mountains.

Supply in German Motorized Units

[Translated at the Command and General Staff School, Fort Leavenworth, Kansas, from a German article in *Die Panzertruppe* July 1942.]

It is in agreement with military principles when it is stipulated in military regulations that the commander is responsible for the weapons and equipment of his unit.

But nowadays, in the mechanical age and the era of modern warfare, the commander of a unit cannot be everywhere at once. For the various technical branches, he must have technical assistants who are able to help him bear the responsibility, i.e. persons who will look out for the weapons and equipment in accordance with his orders and regulations. Just as the ordnance NCO looks out for armament and the clothing NCO has charge of the clothing for the company commander, in the same way in the case of motorized units there is a special supply sergeant, the *Schirrmeister (K)*, in charge of the motorized equipment *(K.-Gerät)* According to the indicated strength, there should be at least one motor supply sergeant in charge of the equipment of motorized units.

The experiences of the author at the School of Army Motorization show that in the choice of those men who are to become supply sergeants with the motorized units, a sufficiently strict standard is not always applied. A "good" motor supply sergeant—and units should and must have only that kind—should be above average both in body and mind. This means that the NCO who is destined to be a supply sergeant with a motorized outfit—only in rare cases should such a man be a lance corporal—must not only possess a good constitution able to hold up under the strain of hard and responsible technical duties, but he must be active enough mentally to be master of the technical principles and to be able to follow the scientific progress represented in motor vehicle construction.

Such a motor supply sergeant must be the superior of his drivers in every technical respect, in practical driving as well as in handling equipment, if he is to be at the head, that is, the commander of the men under him.

Tirelessly, ceaselessly, he must be the adviser and helper of his men. The drivers of the unit must realize that the motor supply sergeant is always ready to help them without regard for time or place. He must be an example for the drivers, both on and off duty. Above all, he must be a soldier and remain one.

The peculiar nature of the duties of the supply sergeant in motorized units gives him an unusual position of trust with the company commander.

He is the technical master sergeant of the unit, if this expression may be used. He must not only be able to operate and work independently but, especially now in time of war, he is often faced with situations requiring a decision on his part that the average officer is seldom or never faced with. For this reason the motor supply sergeant must not only be a good practical man but he must be a good soldier with the qualities of a commander.

It may be objected that he will learn all that when he takes over the job of motor supply sergeant. This objection is only partly valid, however. If the man who is to be supply sergeant with a motorized unit is not physically or tempermentally suited for the work, he will neither learn in the classes for candidates for the position of motor supply sergeant at the School of Army Motorization nor when he is on duty in the unit. Such a misfit makes only trouble for himself and others.

The statement is often heard that an outfit stands or falls with its master sergeant. As far as the motor vehicles are concerned, a motorized unit stands or falls with its supply sergeant. A motorized unit is in good shape only when the motor supply sergeant is tirelessly and unremittingly on the job every minute of the time from early to late.

When, in addition, we consider the fact that supply sergeants destined for motorized units, after successfully completing their technical courses at the School for Army Motorization at Wunsdorf, constitute the material from which technical officials of the automotive branches of the higher services are chosen, it can be realized that the requirements which these men have to fulfill are justifiable. The position of technical official of the automotive branches of the higher services is fully open to such motor supply sergeants. On account of this fact, it is necessary to be very careful in selecting these men.

Duties and sphere of activities for motor supply sergeants with motorized units are defined by the author of this article, Chief Inspector of Automotive Equipment in the Army, in the service regulations. It is self evident that the best set of regulations is unable to meet all requirements, especially in a technical service. If they are to be of any value they must be elastic and applied in accordance with the dictates and possibilities of varying situations. Only the ability to follow the principle rather than the letter of regulations, the correct handling of possibilities, and the correct solution of the problems can be of any value to the unit. This has neither anything to do with waste or extravagance nor with disregard of orders.

The motor supply sergeant has two main spheres of activity, especially in the field. These consist, in the first place, of repair and maintenance of motor vehicles belonging to the unit, and in the second place, of maintenance of supplies.

It sometimes happens, depending on the exact type of the unit and the situation, that one of the senior NCO's is entrusted with one of these services, yet the motor supply sergeant is still responsible. There are repair units or detachments available for making the minor repairs needed by the unit. The commander of these repair services is the motor supply sergeant. The NCO's and men of the repair units, that is, technically trained men, are under his orders. The repair services are mobile and their motor vehicles are fitted out to correspond with the tasks which these troops have to discharge, carrying the necessary replacement parts, materials and tools. The place of the motor supply sergeant with the motorized units is at the tail of the column. In this way, vehicles which fall out are automatically found by the repair services.

When a unit vehicle falls out of the column it is the duty of the motor supply sergeant to give the vehicle a quick going-over and decide whether it can be put back into service with his own means or must be sent back to the next larger repair service, the repair detachments or shop companies. We can see that decisions of this kind may be of great import at times, from the point of view of the subsequent engagement of the particular unit. Usually they must be made by the motor supply sergeant under circumstances where it is not always possible for the commander of the unit to learn first of the damage done to the equipment and issue orders regarding it. Left on his own, the motor supply sergeant must be able to make a clear diagnosis of the trouble and take the necessary steps for its correction.

It often happens, however, that contact is broken with his outfit. The motor supply sergeant then has to be able to show that he is the leader of his men. He is obliged to find the route of march, to make inquiries concerning it or to reconnoiter. In such cases no time must be lost, for there is sure to be some other sick motor vehicle waiting for him with the unit.

How often it happens that it requires several hours to make the repairs on some motor vehicle and the men of his

unit have halted and rested. When the motor supply sergeant catches up with his unit and reports what has happened, the unit is ready to start out again. They know no fatigue. When the unit marches, they also march or help out with the motor vehicles which break down. When the unit halts, they have to make up for lost time or maybe there is another car out of order which requires their attention. Thus the conscientious motor supply sergeant has to remain at his post, fearlessly, steadfastly, with no thought of himself, and he must encourage his men by his personal example and unqualified self-sacrifice.

It is well known what the matter of supplies means in the present war and especially in the Russian campaign. First of all motor service means fuel supply, then replacement parts, tires, and replacement of cars which have to be abandoned.

The matter of fuel supply often brings with it problems which it requires a good head to solve.

There are tank trucks for supplying the unit with fuel and for the transportation of fuel. These tank trucks bridge the space between the unit and the storage depots or fuel columns of the division. As a result of this, these tank trucks are on the road a great deal of the time. In the choice, therefore, of drivers of these trucks, men should be selected who are not only good at handling them but they should also be men who will take good care of the equipment. For while the majority of the drivers travel together and their comrades are there to help them with advice and action, the drivers of the fuel tank trucks, the same as messengers and drivers of field kitchen trucks, are very often alone and on their own resources. In case of a breakdown there is only one thing for the driver to do; that is, help himself. It is, therefore, unwise to assign the poorer driver to these trucks.

The same is true of the noncommissioned officer who is commander over the tank truck forces. He must not only have a good technical training but he must be clear-headed. He must be able not only to solve the problem of the location of supply centers and columns for obtaining fuel, but also to overcome all difficulties in the way of obtaining it, and he must always locate his unit again in time to supply them with the fuel of which they may be greatly in need.

If these requirements are met, the unit always has fuel and the motor supply sergeant will be able to limit himself in this connection to the engagement of the tank trucks at the proper time.

In addition to this, the supply sergeant of a motorized unit will, on his own accord, do all in his power to maintain a constant fuel suply for his unit. He will not wait until the order comes to fill fuel tanks and replenish supplies but will issue fuel constantly in order to have empty tanks for use in an emergency: for example, when the opportunity is offered to replenish one's own stores from captured supplies. In this way he not only saves his drivers from having to travel about in search of divisional distribution centers, but he saves men and matèriel for the higher commands.

Besides the supply of fuel, there is the matter of the supply of replacement parts and tires as well as replacement of vehicles which have to be dropped out of service.

Although with but few exceptions it will always be possible to make use of captured fuel supplies, it is much more difficult to obtain replacement parts and tires. Our situation with respect to raw materials forces us to a rigidly centralized control of the use of this kind of material. It is, therefore, readily comprehended that this type of supplies cannot so readily be obtained. These difficulties are familiar to most persons.

It is necessary, therefore, for the motor supply sergeant to plan and think far into the future. There is a way in which he can help himself in his task and which, when skilfully used, not only benefits him but the unit as well. By constant effort, he can train the drivers to be sparing of equipment and tires. He must take upon himself the responsibility of awakening in the drivers the conviction that it is simpler and less costly to avoid damage than to repair it. He must be tireless in his efforts to induce the men to take good care of the equipment and especially tires. He must keep them conscious of the difficulties involved in obtaining certain kinds of supplies. This educational work bears abundant fruit not only for one's own unit but it lightens the load also for the services involved.

As a rule, replacement parts and tires are ordered officially and on special forms. In making these orders, it is the task of the motor supply sergeant to use the correct symbols and numbers in order that there may be no delay in receiving the correct parts.

The foregoing paragraphs have shown the main tasks of the supply sergeant with a motorized unit. But this has not covered the gamut of his activities. There are, in addition to his main tasks, innumerable details to be taken care of in the actual socalled "interior administration," details which are seldom or never apparent to one on the outside but which, nevertheless, are just as necessary.

Also, what has been described represents only the duties of a supply sergeant of a motorized unit with a fully motorized formation. This type of supply sergeant is found in many other places in the service.

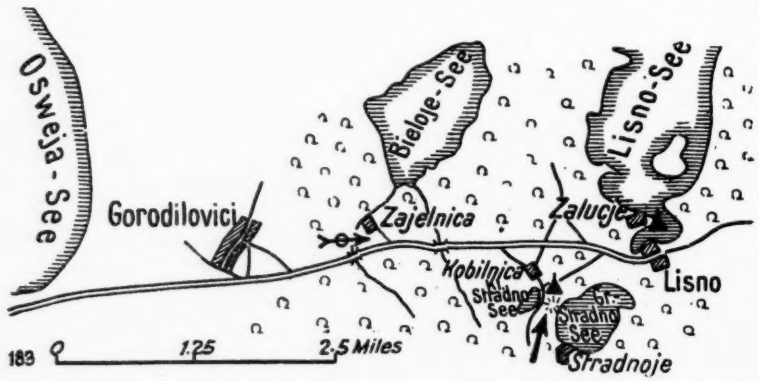
The supply sergeant of the motorized unit wears the officers' "frog" which signifies double obligation. He must not only be a shrewd assistant to his company commander, but he must also be the commander of the man under him and an example to them. He must live his life before them and, if there is an occasion for it, die before them, true to his oath to the colors.

German OP's in Russia: Lake Lisno

[Translated at the Command and General Staff School, Fort Leavenworth, Kansas, from a German article in *Artilleristische Rundschau* May 1942.]

Though the roads up to that time had been difficult, east of Lake Osweja (see sketch) they became indescribably bad and at times had grades which brought everything, including the tractors, to a halt. Surrounded by enormous stretches of forest, typical swamp and lake terrain, these roads gave promises of many experiences.

For securing the advance I received the order to station the leading battery in the village of Kobilnica, but on account of the condition of the roads requested a firing position to the southeast of Gorodilovici. The two other batteries got only to the stream south of Zajelnica where they took up their firing positions.



It was really impossible in this crazy terrain to find locations for observation posts with good, comprehensive views over the battery observation sectors. We managed, however, to get glimpses into this or that area. The batteries were divided among the different battalions. Each battery commander, therefore, was his own advanced observer, bound to no one place but moved at will from company to company wherever he could see best and be of the most help in firing. At last a position was found for observation toward the north that had all the regulation advantages, the narrow promontory probably 50 meters in height which extends out into Lake Lisno east of the village of Zalucje. There, in the neighborhood of the battalion command post, the "call battery" (a battery operating within calling distance of a command post—Ed.) had taken up its position to watch over the east and north shores of the lake. This position really afforded a

full view over the whole area since it looked down upon it from an elevated location. In the shelter of the wooded summit the observation post was established without the knowledge of the enemy. No movement to or from it could be observed by them. It was possible in this place to construct shelters wholly concealed from our adversaries for protection against enemy fire.

If our position had been subjected to fire by some clever unit on account of its being a prominent landmark, the chance for a hit would have been very slight. Short shots landing in the lake would have been harmless. Some of the longer shots would have struck the steep shore which rose almost perpendicularly out of the lake, but most of them would probably have missed the summit whose breadth was only 10 meters (about 33 feet). How would German artillery combat this highly instructive target? Perhaps by means of ricochet fire on the surface of the water with the fuses set for considerable delay!

However, the enemy came out of the woods on the shores of Lake Lisno in the form of bands of deserters. They attacked only in an entirely unexpected place half to the rear on our right flank on Lake Stradno. A bicycle company and antitank troops were engaged against the Russians who poured out of the woods in this place, dug in, and worked their way forward.

Fortunately, the bad roads had hindered the batteries, in taking up their positions, from going too far to the east where they would have been hit squarely in the flank by the enemy's drive. Hence the whole battalion was now easily able to swing around toward Stradnoje from the neighborhood of Zajelnika. I myself rode into this area with the advanced observer of the "call battery," the youngest lieutenant of the battalion. On a wooded knoll between Big and Little Stradno Lakes the bicycle company was stationed in excellent shelter. The observation post which was to be set up here within 100 meters of the enemy afforded a surprisingly good view. Looking down from the summit we could see the Russians diligently digging themselves in. In order to make the surprise complete it was necessary to avoid loud talk. It was certainly not a simple matter to direct fire from this extremely advanced post, but the very first shot from the barrels of our guns landed on the target. And after he had adjusted the fire of battery after battery, this officer pounded the enemy position with the fire of the whole battalion, employing ricochet fire from the flank, until things were so hot for the Russians that everyone who was able to run took to the woods. Then this portion of the woods itself was so systematically combed by artillery fire that the enemy was careful not to show himself again.

In any case, the engagements on Lake Lisno showed the importance of advance observers in an impressive manner.

With a Field Ambulance in Libya

[By Captain W. T. E. Blackmore, R.A.M.C., Assistant Instructor Officers' Wing-Depot R.A.M.C., in the *Journal of the Royal Army Medical Corps* (Great Britain).]

Command of a Field Ambulance entails the careful consideration and satisfactory solution of a host of problems, varying in type from the correct tire pressure in a load carrying vehicle to the ingredients of the evening stew and, of these, not the least is the problem of distances.

Disposition distances for Advanced Dressing Stations and Main Dressing Stations and movement distances for bounds are not only the subject of inspired calculation but also the source of many a persistent headache, for they must be considered not only from the medical angle but also from the "Q A" point of view.

While the opportunities for treatment will necessarily be limited by the strategical situation, it is axiomatic to state that the role of the Field Ambulance, and more especially the Light Field Ambulance, must always be the adequate treatment of casualties and their rapid evacuation out of the forward area without at any time losing its mobility.

Events in the present conflict have moved so rapidly that the only theater of operations which has so far presented opportunities for the study of Field Ambulance tactics in modern warfare has been the Middle East.

These notes are based upon my experiences in this area as second in command of a Light Field Ambulance in addition to periods of duty as Deputy Assistant Director of Medical Services and Embarkation Medical Officer during the Wavell campaign in Libya.

The campaign in Libya has been taken for analysis not only because it provides an excellent example of a complete operation over a definite period of time but also since it was an operation of advance and presumably the precursor of similar future operations.

The material gains from this campaign are not detailed nor has it been considered necessary to describe the local conditions, the comparative shortage of rations and water or the difficulties of supply and replenishment, since these are, by now, common knowledge.

It is impossible also, for security reasons, to describe the methods employed in supply and replenishment other than to say that they were, in spite of conditions and considerable difficulties, in every way excellent.

The Armored Division to which our Field Ambulance was attached went into action on December 9, 1940, and was relieved on March 5, 1941, a period of eighty-six days of hard fighting and rapid movement.

The method of employment of Field Ambulances during the entire period was that of using Main Dressing Stations in echelon with some sections brigaded as Advanced Dressing Stations and others sited for other functions in accordance with the situation.

On some occasions, when the intervening distance was rather great, a section was situated between the advanced and rear Main Dressing Stations and on other occasions sections were opened for similar reasons between the rear Main Dressing Stations and the Casualty Clearing Station.

The combination of two or three sections to function on a forward Advanced Main Dressing Station was often found advantageous, both for operation reasons and as a foundation on which the Main Dressing Station proper could be built lorry by lorry, if necessary.

The role of Advanced Casualty Clearing Station was carried out by the Head Quarters and Companies of the Corps Field Ambulance—a very necessary procedure in view of the rapid movement.

At the same time general health remained, on the whole, surprisingly good.

Desert sores, inflammation of arcolar tissue, were fairly common but only in severe cases resulted in incapacitation.

It was notable that these sores occurred only on the exposed parts—hands, forearms, knees and neck—and it is possible that the devitalization of the skin by over-exposure to the sun, plus the abrasive action of sand particles, may have been a causative factor.

Ascorbic acid tablets were administered as a routine measure with some units to counteract any possible vitamin deficiency but, as cases occurred at more or less equal rates in treated or untreated units, the value of this procedure was doubtful.

Mild gastric enteritis, the "gyppy tummy" type, occurred fairly frequently but was as a rule of moderate severity and only a small percentage of cases required evacuation to the base.

Cases of jaundice were not uncommon the cause of which was difficult to establish but it was considered likely that the severe fall of temperature at night had some bearing on the condition. This is very possibly a definite factor in the causation since the extremes in temperatures are very severe indeed, shorts and shirts being quite enough during the day and pullovers, battledress and greatcoat not enough at night.

It may be thought that an eighty-six day campaign is not an unduly lengthy period but the fatigue consequent upon twenty-four hour duty during this time has to be experienced to be believed.

It must be borne in mind that whereas in the 1914-18 war, short periods of "front-line" duty were alternated with periods of rest at the base, this eighty-six days represents continuous "front-line" duties with all the stress and strain that this implies, plus the absolute absence of any sense of security of position—the order to "up stick and away" could be expected at any time of day or night. In addition, too, there was the ever present menace of air attack, the superiority at that time held by the enemy, enabling him to attack most targets with comparative ease.

The average length of stay in stations was approximately six and half days but during the intensely active periods, two or three days only were spent in each place.

In the light of these experiences in the Western Desert, certain conclusions have been arrived at, and are appended for consideration by Field Ambulance Units.

Map Reading

The value of training in map reading, use of both the prismatic and sun compass, with a good working knowledge of stellar constellations cannot be underestimated.

All Officers, Non-commissions Officers and Ambulance Drivers received instruction in this department and the time spent in training was well repaid.

On many occasions when the work had to be carried out during "khamsins," the hot unpleasant dust-storms so frequently encountered in this region, efficient training in this, plus adequate track-making, saved many who would otherwise have been hopelessly lost.

The comparative infrequency of recognizable features on the landscape made "travelling on a bearing" a matter of daily routine; ambulance drivers very soon became accustomed to it—one imperturbable character whom I can call to mind thought nothing of starting off on a 40 or 50 miles run with no other aid to travel than a rough sketch map of about three pencil lines, the knowledge that his bearing was about 120°, and a toy compass, the type that could be purchased for a shilling before the war, whose angle of magnetic deflection was anything up to 30°—but *mirabile dictu* he always got there and, however bad the going or khamsin, never turned a hair.

Shelters

During the training period, particular attention was paid to instruction in the loading and unloading of vehicles and also the rapid erection and striking of shelter tents, a policy which, during rapid movement, was amply justified.

Penthouse shelters were not an issue at that time. Field Ambulances worked with tarpaulin lean-to shelters, 30 by 40, or 30 by 30, and these to my mind were, in several respects, notably for easy camouflage and greater available floor space for stretcher cases, superior to the penthouse.

Passive Air Defense

Passive Air Defense measures again proved the value of dispersion. Two hundred yards between vehicles, both on the move and when established in a Main Dressing Station, was an inflexible rule and the parking of two vehicles together was never permitted, the axiom being that a bomb may hit one truck but it must never destroy two.

It was observed, of course, that bombing always had a salutary effect on this drill and on slit trench digging. A definite drill was laid down for slit trenches —invariably one had to be dug before a shelter could be erected—this proving valuable against surprise attacks.

The shelter itself was dug in wherever possible, or a low sand-bagged wall built around its inside wall, and the lorry engine was protected with a further wall of sandbags.

A slit trench dug under cover of the shelter itself, large enough to take a stretcher and covered with boards until required, proved to be a valuable protection for casualties. Many Field Ambulances are prone to overlook the fact that they are responsible for the safe custody of their patients as well as for their treatment. Air sentries equipped with whistles, both on the move and whilst stationary, were always used as a further Passive Air Defense measure. Incidentally they had to be relieved hourly as local conditions made it impossible for men to do a longer tour of duty.

Maintenance of Motor Transport

Care and maintenance of Motor Transport was always an important task, efficiently carried out by the transport officer and his Royal Army Service Corps personnel, but one very soon learnt that a personal check of a vehicle before proceeding on a journey was always advisable.

The Transport Officer has a full time job and here Field Ambulance Officers, who as a general rule have sufficient technical knowledge for the checking of petrol, water, oil, spares, batteries and tires and who make it their duty to carry out a brief inspection before starting out, can render much valuable assistance.

A common sense precaution adopted was to encourage the wagon orderlies to learn to drive and maintain a vehicle and, in addition, to teach the drivers something of first aid principles.

This interchanging of duties was very useful; the only drawback, human nature being what it is, was that the drivers were always more interested in the casualties and Nursing Orderlies more interested in the engine.

Clearing the Forward Area

Experience definitely established the conclusion that evacuation must be initiated from before backwards. Regimental Medical Officers all had ambulance cars allotted to their units and cleared their casualties in these vehicles back to the Advanced Dressing Station.

The depth of the battle zone necessitated this procedure, areas being so great that if Advanced Dressing Stations had been left to clear them, the scheme of evacuation would have been slowed up considerably with a subsequent deleterious effect on the condition of the casualties.

This worked very well, as also did the Light Field Ambulances, and it was clear that Field Ambulances of this type were eminently suitable for this type of warfare—a number of light mobile Advanced Dressing Stations being essential for the rapid evacuation of casualties.

Surgical Treatment

No unit forward of the rear Main Dressing Station could undertake any radical form of surgery since it would have entailed the sacrifice of its mobility—the quality that must always be the essential attribute of the Field Ambulance in modern warfare—but one imagines that the use of forward surgical units, sited near the main Dressing Station, can solve this problem.

It will be appreciated that some of the conclusions drawn cannot, for security reasons, be published and also that many that have been drawn are, to some extent, applicable to problems peculiar to desert warfare with its greater fluidity of movement. At the same time a study of continental, Russian and Japanese campaigns will show that a similar degree of mobility may be expected and that the problems that will be encountered may not be so very different.

In conclusion it is emphasized that personnel of Field Ambulance units must be regarded and trained primarily as soldiers; competence in first aid, although essential, must always be secondary to their training as Field Troops.

It is impossible to make a doctor out of a Royal Army Medical Corps recruit in six or twelve months but, if in the same space of time he can march 100 miles in three days on a tin of "bully" and a "billy" of tea and do a full day's work at the end of it, if he can find his way about strange country, with or without a map, without losing his head or himself, can make himself a comfortable "bivvy" out of nothing and can cook himself a good meal with the aid of a mess tin and a handful of wood—then he is likely to be much more of an asset to a Field Ambulance than the man who knows all the knots on all the bandages on a Thomas split but who cannot for himself, let alone his patient.

Action Against Enemy Antitank Artillery

[Translated at the Command and General Staff School, Fort Leavenworth, Kansas, from a Russian article in *Krasnaya Zvezda* 8 December 1942.]

Our tank troops are extensively used in attack operations at Stalingrad and on the central front. They break through the German defensive zones, destroy isolated centers of resistance, and strike at the rear and the communications of the enemy. With machine-gun and gun fire, the Soviet tank troops kill thousands of enemy soldiers and officers, while their treads crush dugouts and machine-gun nests.

During the course of the war the Germans have often felt the weight of the blows of our armored units. Recently the enemy has feverishly begun to equip his units with various weapons for fighting tanks. The German orders and instructions provide a great number of antitank defense measures. The enemy is giving particular attention to the qualitative and quantitative reinforcement of antitank artillery as a basis for a system of fire in defense. Special 37- and 50-mm guns are by no means always able to penetrate the armor of our medium and heavy tanks, and for this reason the Germans are using infantry weapons of large calibers and antiaircraft artillery guns in combat with the Soviet armored vehicles.

Action against the enemy antitank artillery is one of the most important tasks of Red Army units in attack. Prompt and dependable silencing of hostile batteries and individual guns clears the way for our tanks and achieves victory with fewer losses. Wherever tanks come into battle in areas of undisturbed systems of hostile fire, and without the benefit of continuous support by infantry and artillery, failure results.

For example, such cases as the following are well known. A certain unit, accompanied by tanks, was ordered to take a hill commanding the region. The hill appeared to be unfortified; the Germans had not betrayed the number and dispositions of the machine-gun nests. The com-

mander of the unit, relying on the fire power and striking force of his tanks, threw them directly into the battle, restricting himself to a brief artillery bombardment of the forward edge of the hostile defense. The Hitlerites allowed the attacking tanks to come up close, and then the hill became alive with dozens of guns at various ranges and directions. The tanks, not having expected such resistance, slowed down and began to answer the fire. But in the end they were forced to withdraw to the starting positions. This same hill was easily taken after well-planned preparation, and the Germans fled in disorder.

In order to fight the German antitank artillery effectively, it is necessary to know its tactics. The Germans distribute their antitank artillery both along the front and in depth, dig it into the ground, camouflage carefully, and open fire at short ranges. All this increases the difficulty of the artillery observers. But with expert, well-organized reconnaissance even the most deceptively hidden guns may be detected fairly accurately.

It is important to determine correctly which approaches to the enemy positions are most dangerous for the defenders as far as tanks are concerned, and which places are best adapted to antitank obstacles. Then it will be evident where to look for hidden machine-gun nests and in what places unremitting observation is necessary. It is absolutely essential to investigate in detail the routes of the proposed movement of the tanks, the foot and slope of each height, to find out beforehand about all the suspicious places, slight elevations, irregularities of the ground, and everything else that might prove to be an antitank firing point. It is necessary to make wider use of feinting movements by our tanks, in order to force the enemy antitank artillery to reveal itself.

On the basis of the types of reconnaissance mentioned, the support of the tanks by artillery fire is planned. This is the most vital stage of the whole operation. The artillery must silence the antitank elements of the defense with certainty and support their own vehicles continuously, from the beginning of the artillery attack to the completion of the mission. This, of course, does not mean that the tanks have only to storm through the positions of the demoralized enemy. They still must come to bear vigorously on the enemy machine-gun nests and personnel. But the main burden of preparation for tank attack is the responsibility of the artillery.

The artillery must closely cover with its fire the concentration of tanks in positions of departure. For ten to fifteen minutes prior to the attack, it must come down on all positively indicated enemy antitank elements on the forward edge and then accompany the tanks from one objective to another with a rolling barrage. The task of the artillery is to destroy the antitank guns, to deny visibility to the hostile observers, to permit no aimed fire at our tanks, and to prevent the approach of German reserves.

On tank support individual guns play an important role, accompanying the vehicles by fire and on wheels. Some commanders underestimate the effectiveness of such accompaniment, and, relying on the powerful armament of the tanks themselves, they do not assign artillery units to follow directly behind the tanks. But, no matter how strong the fire from concealed positions, some undamaged or revived guns of the enemy always remain on the field of battle. With point-blank fire they may destroy more than one attacking armored vehicle. The accompanying guns must deal with these weapons by firing point-blank at them and moving forward by stages, as the tanks advance.

But not only the artillery will carry on the fight against the enemy's antitank equipment. The tanks themselves can and must shoot the gun crews and crush the enemy equipment under their treads. The duty of the Soviet automatic riflemen is to destroy the personnel of the German antitank units. The commander who organized the battle must, with strict conformity to the situation, make full use of the means at his disposal for the liquidation of the system of antitank defense fire both in the period of the breakthrough and during the development of the battle in depth.

We often forget this last matter. While the troops are assembled and preparing for the breakthrough, reconnaissance is actively seeking and establishing the position of German antitank elements, the artillery is bombarding the hostile positions heavily, and the tanks are therefore advancing well. But as soon as the forward edge is broken up and the battle is raging in the tactical depth of the defense, the tanks are left to themselves. The artillerymen sometimes do not notice new objectives from their main observation posts, they are slow to bring fire to bear on them, and they leave undisturbed the flanking guns of the enemy, which are especially dangerous for tanks. Such a situation cannot be tolerated. The shell bursts must be laid not too far from the tanks. A curtain of fire must be maintained near the front of movement of the vehicles, and, when necessary, along their flanks. The calling for and correction of artillery fire should be more widely practiced with advance observers placed in tanks. Then not a single gun interfering with the movement of our tanks will be neglected, nor a single shell be used without effect.

Soviet tank attacks inspire fear in the enemy. The Germans make use of every means, particularly antitank artillery, to neutralize the penetrating power of our tanks. The problem of the Soviet artillerymen is to paralyze these efforts of the enemy. The fire of our batteries must open a wide path for the armored forces moving at the head of attacking units of the Red Army.

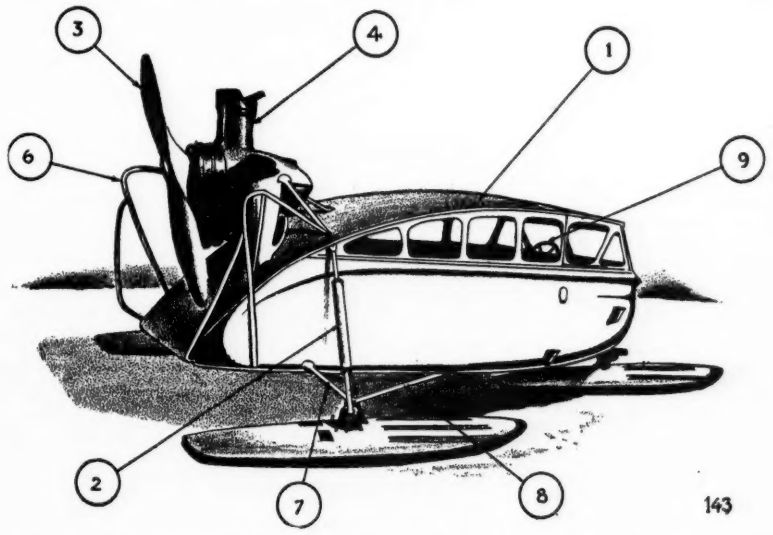
Soviet Aero-Sleds

[Translated from the Russian text in *Lumber Industry Magazine.*]

Conditions for automobile traffic in the U.S.S.R. differ radically in winter from summer. Regular automobile or truck traffic between cities and villages depends directly on clearing the roads of snow. Roads not cleared sometimes are impractical for motor traffic during the entire winter.

In the north, lack of roads has formerly made dog, deer, and other types of the more primitive sleds necessary for transport. These are now being replaced by mechanized sleds which have good traction both on hard-packed snow and soft, new snow. At first caterpillar tracks (half tracks) were employed, but it has been ascertained that for exclusive winter transport aero-sleds are faster and more efficient. At first, three-ski aero-sleds were used, but of late a new four-ski aero-sled has been developed. Its design gives greater mobility and greater load capacity.

Aero-sleds must satisfy certain mechanical demands. They must be able to travel not only on snow-free or country roads but also on new snow. Hence the supporting surface of the skis must completely safeguard the sled from falling through the snow or getting stuck in it. Experience in the U.S.S.R. has proved that the load weight of the sled while in movement must not exceed 1,200-1,350 pounds per square yard of supporting surface. The total weight of the loaded sled must not exceed 33 pounds per engine horsepower.



Other essentials include durability of construction from inexpensive, plentiful materials. The driver and crew must be protected from head winds and must be able to observe the road to the front and

on both sides. Brakes are needed to assure safe descent on steep inclines, especially on slippery and rolled roads. The propeller blades must be equipped with some form of guard to prevent accidents.

It may be said that the essential qualities of aero-sleds are: simplicity of manufacture, low cost, ease of repair, good driving power, and ability to move off independently when the skis are frozen to the ground.

The accompanying sketch shows a general view of the Soviet NKL-16 aero-sled with an M-11 motor. All accepted types of aero-sleds have a closed streamlined cabin (1) which transports 6 to 8 persons plus freight, depending on horsepower of the motor and design of the sled. The cabin is mounted on shock absorbers (2) which are connected to the three (or four) skis. The motor (4) is generally mounted on rear of the cabin and has a pusher type propeller (3) with a guard (6). The skis are connected to the body also by means of universal joint semi-axles (7) and "unloading" connecting rods (8).

This three-rod type of mounting of the skis insures proper shock absorption and fixes the skis rigidly in relation to the body of the sled. A turn of the steering wheel (9) causes the front ski to turn. In the four-ski type aero-sleds of the latest design, the two rear skis glide in the tracks made by the front skis. The brakes are applied by pressure on a foot pedal which causes 1 to 1½ inch metal rods to protrude from the bottom of the skis and engage in the snow. An aircooled motor in aero-sleds eliminates radiator and water complications in the cylinder sleeves and lends to light design.

The quality of movement of the aero-sled depends upon K: the ratio of the traction efforts of the screw (E) to the general travel weight of the sled (Q) or by formula $K = \frac{E}{Q}$. This ratio characterizes the limit coefficient of the friction of the sole of the skis against ground which can be traversed by aerosleds. For three-ski aero-sleds it must not be less than .25 and for the latest four-ski models not less than .22.

The coefficients of friction for the different snow surfaces against the metal sole of the ski follow:

Characteristic of the Snow Surface	Coefficient of Friction	
Icy roads	.008	-.01
Rolled snow roads (clean)	.012	-.018
Soft snow roads	.025	-.05
New snow with ice crust	.012	-.025
New snow, soft	.03	-.08
Fresh fallen new snow	.10	-.15
Grainy snow	.15	
New snow which is thawing 39°F	.2	
Very dirty snow road which is thawing 39°F	.2	-.4
Bare ground, sand, stone, or asphalt	.2	-.5

The above table shows that the magnitudes of the coefficient of friction are changeable.

The improvement of travel qualities of aero-sleds can be accomplished by: reducing the weight of the sled by lighter construction, reducing the load capacity (a serious disadvantage), or increasing the traction power of the screw. The latter may be accomplished by improving the design of the screw or using a motor of greater power. It may be considered that the present models of aero-sleds yield roughly a power effort of the screw equivalent to 6 to 6.5 pounds per motor horsepower.

Although the average speed in actual work is lower, it is possible to drive aero-sleds at a speed of 20 to 30 m.p.h. depending on the snow surface and the experience of the driver.

As the Soviet Union lacks winter roads, the opportunities for using aero-sled transportation are very numerous. For that reason, in spite of the favorable achievements in design and efficiency over even rough snow and ice, many improvements can yet be made. A switch to the use of heavier fuel as well as to simple and inexpensive motors and steel screws should be combined with further perfection of body design and of moving parts.

Combat with the Counterattacking Enemy

[Translated at the Command and General Staff School, Fort Leavenworth, Kansas, from a Russian article by L. Visokoostrovski in *Krasnaya Zvezda* 10 December 1942.]

In an area southwest of Stalingrad the endless steppe is dissected by gullies and ravines, and by a dry river channel. Here a retreating unit of German troops managed to cling to the locality and organize a defense. Trenches, dugouts, and permanent log and earth fortifications had been prepared earlier. To them the Germans hurriedly added barbed wire entanglements and mine fields, and set up heavy and light machine guns in the fortifications extending along the declivity. On the forward slope of a small hill and in the outskirts of an inhabited place there was a labyrinth of trenches. All this taken together constituted a hostile center of resistance which blocked the way of our attacking units.

In this area the Germans began to concentrate a powerful force in order to break through to the southwest. As always, they began an intensified reconnaissance. The weather did not permit the enemy to use aircraft for this purpose, so he operated with tanks. Small detachments of vehicles traversed their forward edge and attempted to penetrate the position of our troops. Under action of the accurate fire of antitank weapons and artillery, they rolled back in retreat or caught on fire. After a few days the fierce counterattacks of the Fascists began.

In the morning the rhythmical roar of the motors was heard through a damp and heavy fog. The noise increased and drew nearer. It was not like the usual clatter of three to five hostile reconnaissance tanks. Our combat outpost reported the approach of the Germans and opened fire. About forty hostile machines crept up out of the mist. They were moving cautiously, as if feeling their way, ponderously crawling up over knolls covered with the first light snow and across the dark shell holes. Beside them and behind them, scarcely distinguishable, loomed the silhouettes of the soldiers.

"Cut the infantry off from the tanks!" ordered the commander in response to the report. The execution of this order depended mainly on the heavy mortars, directed by Lieutenant Emelyanikov.

Firing under conditions of limited visibility requires careful preparation of the data beforehand. The range of gullies, ravines, hollows, and slopes is established by shooting in daylight. Curtains of fire are also aligned in zones. All the range elevations are written down. An aiming point is chosen in the immediate vicinity of the firing position. Where this work is done accurately and rapidly, the counterattacking enemy does not achieve success. And so it was here also.

"The Germans are crossing the channel," came the report to Emilyanikov. He ordered the opening of fire on the channel. The mortar commanders swiftly drew their notebooks from their pockets or plane tables and quickly read aloud the necessary data. The gunners set their sights accordingly and leveled their instruments on the aiming point. The shells burst in the dry river channel.

Out in front explosions roared, and the damp fog began to take on a rosy color. Then came a new command. The barrels of the mortars rose still higher. This meant that the enemy was still advancing, and fire was being shifted nearer, into the next zone. The roar of explosions became more distinct.

The counterattack was beaten off. Five hostile tanks were on fire, ten were disabled. But the Fascists did not stop at this. Despite their large losses, they threw themselves again and again at our positions. Each time tanks and motorized infantry took part in the counterattacks, accompanied by artillery and mortar fire.

The enemy's counterattacks continued all day and all night, and the number rose to more than ten. Here and there the Germans sometimes succeeded in wedging themselves in, but they were immediately thrown back. Our men, excited by the battle, did not get a moment's sleep, and did not eat or drink, while beating off the enemy's attacks.

On the following morning German bombers entered the battle, because the fog had dissipated and the cloudiness had cleared. The hostile planes swept down from the sky with a piercing scream. Our pursuit planes appeared and the Fascist aircraft made off.

But to repulse the counterattacks once is not to destroy a large hostile force or to deprive it of its ability to act, especially if the enemy still has the ability to regroup his strength. It is essential to attack, to move forward, to drive wedges into the combat formations of the foe, to break them up, and to smash them in detail. As soon as our command noticed that the Germans were sufficiently worn down by constant counterattacking, the order was given to attack.

A rifle regiment brought up to the battle from the rear delivered its blow at the enemy at the moment when one of his numerous counterattacks had been beaten off. The regiment demolished a series of German strong points and dugouts, broke through the barbed wire in places, and advanced about 400 meters (440 yards), penetrating the first line of fortifications. Violent hand-to-hand fighting broke out in the trenches and communication trenches. With bayonets, hand grenades, and point-blank fire the Soviet warriors cleared the way to victory.

When the attackers approached the second line of German fortifications, the enemy counterattacked once more. About two dozen tanks bearing automatic riflemen atop their armor, together with a

battalion of hostile infantry, emerged from behind a hill threatening the open flank of our regiment. Our artillerymen and several tanks came to its aid. Quickly shifting their combat formation, they hastened to move up on the flank of the armored force. The German counterattack again collapsed. Having lost ten tanks, the Fascists scurried off behind the hill. Then the enemy's aircraft appeared again, dropped bombs, and flew off. This did not break the attack spirit of our troops. They quickly re-formed and, advancing step by step, took possession of the new line.

A force of automatic riflemen was sent into the breach atop fast tanks. Lieutenant Starchenkov, the leader of the force, was to seize a height situated in the German rear, and, consolidating himself there, was to fire on an inhabited place located nearby, which served the Germans as a concealed position for concentrating their forces. The success of the battle as a whole depended largely on the actions of this tank-borne force.

Discharging the automatic riflemen on the hill, the tanks penetrated farther. They scattered a new group of the enemy which was preparing a counterthrust. Lieutenant Starchenkov, having killed up to forty Hitlerites, continued to hold the height and helped the attacking infantry with his fire. In the afternoon the battle shifted to the outskirts of the inhabited place. Our units entered the breakthrough one after another and widened it. Attack planes which bombed the German fortifications supported them.

The Fascists still kept clinging to every defensive terrain feature. Here and there hand-to-hand fighting flared up, and sharp fire at short distances broke out. As also in the beginning of the action, the gunners under the command of Senior Lieutenant Emelyanikov distinguished themselves by skilful organization of fire. In the period of the most stubborn resistance of the enemy, they destroyed, according to statements of the units, seven German machine guns, one artillery and three mortar batteries, and dispersed nearly a battalion of Fascists moving to counterattack.

Towards evening our units captured the opposite bank of the dry river channel and the inhabited place, and moved ahead up to one kilometer (three-quarters of a mile). The German force which was intended to effect the breakthrough was dispersed and partly wiped out.

Attack on an Antitank Formation

[From an article in *Die Panzertruppe*. Translated from German at the Command and General Staff School, Fort Leavenworth, Kansas.]

This article, although it concerns itself with an action which took place in 1940, was included here because of the fine examples of initiative, the unexpected turns of events that had to be dealt with, and the good narration of the action which colors the whole situation.—THE EDITOR.

It was Whitsunday, 12 May 1940. We were already approaching our day's objective, the region around Brusthem to the east of Saint Trond at 10:00 AM. Without a minute's sleep, after breaking the resistance of the enemy, we had been ferried across the Albert Canal in the night, after which we had penetrated 40 kilometers into the enemy's territory toward the southwest. We had encountered a few barricades, abandoned equipment and battle-weary Belgian soldiers but no resistance worth mentioning so far. We had even captured a heavy battery with guns all attached to their limbers. When we, just as much surprised as the Belgians, hurridly got our tanks and machine guns into position, 40 men immediately stuck their hands into the air. The bridge over the Demer, ready for blowing up, had fallen into our possession undamaged.

Just as we reached our final destination for the day we found a tank waiting for us, hidden in a clump of brush. It brought down the motorcycle rider with the point of the column, and the driver of the commander's car as he sat beside the commander, then disappeared before the antitank cannon with the advance detachment had a chance to destroy it. With righteous anger in their hearts, the antitank men searched the country for it, but the tank had made its getaway.

We established ourselves in a circular formation around the two villages of Brusthem and Ordingen. In the course of this maneuver, a second battery fell into our hands. Two tanks again advanced cautiously toward us, but disappeared for good at the first shot from our antitank cannon.

Suddenly a radio operator appeared with an order from the division: "New day's objective for the advance detachment: Hougaerde." Out come the maps again as we hunted for Hougaerde! We figured it was either to the south or southwest of Saint Trond. For a long time we searched for the detachment's combat post. We finally found it, but it was 4 kilometers southwest of Tirlemont on the west side of the Big Gette! That made it 30 kilometers farther into enemy territory in a westerly direction. The officers looked at the commander. He knew what their look meant, and said: "Well, that is quite a little for one day." A scouting detachment in Saint Trond had just been fired on by snipers.

Our loss of sleep was telling on us, but it made no difference, we had to go on. Every minute was important. We knew that we must not give the Belgians any breathing spell, or the English and French who were coming up any time to reinforce them.

So there was nothing to do but get ready. Our commander gave the orders: "1st Antitank Company in the lead; Wherever the enemy is encountered, he is to be beaten."

Courage is half the battle, but we had to be doubly watchful now as we would naturally run into stronger and stronger enemy forces. We had become acquainted with his method of fighting since passing the Meuse-Schelde canal: he would let us come close to him, then attack us on the flank or in the rear as much as possible.

We were not able to go around Saint Trond so we had to go through it. Half the crew in the gun-towing trucks watched the houses on the left, the rest, the houses on the right, ready with their rifles in their hands. But evidently the sight of the interminably long column caused the snipers to lose their nerve. We learned from some of the people of the village that Belgian and French soldiers had left not over three hours before, and had gone in a westerly direction. Well, we would soon find out!

We now made our first halt. Our company, the leading company, had just passed through Saint Trond. Suddenly a messenger came back with the report: "barricade at Berg op Zoom." Stones, tree trunks, farm vehicles formed a barrier across the whole right of way. But there was none of the enemy there. So on we went.

A kilometer farther on, on the east edge of Dormael, we found another barricade. This time a couple of machine guns were pouring their fire on us, and the report of rifles was heard. But we were trained for this sort of thing. Our antitank men went after them with cannon and machine guns. The Belgians were not able to stand this for long. The enemy motorcycle troops hurriedly cleared out, leaving us to make an opening through the barricade.

This same thing took place every kilometer of the journey except that the resistance gradually became greater, but under the leadership of their iron-willed commander the troops of the 1st Company hurled the enemy back in magnificent style from barricade to barricade. Thus, we advanced a step at a time. Through Orsmael, Gussenhoven, Overhespen and Elixem, the Belgians were driven back.

Now that we had crossed the Little Gette bullets were humming in greater numbers past our ears, coming from the neighboring hills. But we did not stop for this. We simply assigned a machine gun or antitank cannon to the task of holding these fellows down. This situation got less pleasant after we passed Elixem. Bullets were now flying all around us. It sounded like a swarm of bees. The enemy made few hits, however, only a small number of our men being slightly wounded.

True to the motto of the battalion: "Fast, daring and hard as iron," the men of the 1st Company advanced boldly through the humming bullets and drove the nearest machine gunners back toward Meer. But as we attacked the enemy at the railway east of Meer an infernal din suddenly broke out. The towing truck with the advance detachment, which attempted to make a bold dash ahead, was suddenly struck by several antitank shells. In the unceasing din of the machine guns, there was heard the repeated roar of exploding shells of various calibers. Our company suddenly found itself in the midst of a regular inferno.

The 2nd Company, which was following, went into position at the west entrance of Elixem in order to catch their breath in the midst of the fray and give the hard-pressed 1st Company some relief. We were forced to go around in a broad half circle in order to get the guns into position, for the enemy was now firing from the north, west and south. It was fortunate for us that the squadron of bicycle troops kept the rear clear, and also, by well directed machine-gun fire, preventing two enemy bombers from scoring hits.

Our drivers in Elixem scarcely knew where to station their vehicles for bullets were flattening themselves everywhere against the walls of the houses. Bullets were even coming from isolated houses and when, finally, shells began fly-

ing at us from the church tower to our rear, we turned a tank cannon around and settled matters for these gunners.

Our AT companies were now firing with every gun at their disposal at the invisible enemy, but his fire continually became stronger. The adjoining hills were spewing fire, yet nothing was to be seen of the enemy. We were glad when, once in a long while, we could catch sight of a flash of fire—probably coming from an AT cannon—in order to have something to aim at. It was lucky for us that night was coming on, the light was getting bad, and the Belgians no longer were able to make many hits.

There existed no doubt, after we had thrown back the enemy outposts to the other side of the Little Gette, that we were up against superior enemy forces which were defending themselves from well-prepared positions on the hills to the west.

To butt our way through this stone wall was not a job for our small advance detachment. We had to find some other solution for this problem. We were now stopped and we had to see, as German soldiers, what we could do to master this situation. The 1st Company was under fire from every side and the 2nd Company was not in a much better fix. First of all we were . . . But what's that coming out from among the houses of Meer? That's a tank! There's another one over there; and there's another . . . three, four, five of them! Did the enemy want to attack us? The eyes of our antitank men lighted up! At last a target! Even the nerves of the No. 4 gunners were taut to the breaking point. Like the panther, that armed animal, the antitank man, the gun-layer, watched ready to spring, ready to destroy, behind the telescope sight. "Antitank shells! The third on the right! 800 meters!" It was the voice of the gun commander at his side. Quickly, with both hands, yet cooly, he manipulated the controls which brought his rapid cannon to bear on the target. Finally the command was given; "Fire at will!" The shell was on its way! The first of the tanks was hit —and the second! The others had already turned, but suddenly the third of them was struck.

Those were certainly tense moments. But now the fire of the angered enemy became heavier.

The 2nd Company was able to hold its own, but how were matters with the 1st Company up ahead, cut off by the enemy's fire? For some little time now not a messenger had got through.

Making his way from house to house and creeping through the ditch along the road, the commander worked his way forward through this inferno. Half way there, he was met by the young lieutenant of the 1st Company. Face, looks and bearings betrayed the deepest agitation as he reported, panting with excitement: "We are being fired on from every direction. We can neither advance nor retreat. The commander of the company was killed as he attempted to prevail on his men by his own example to advance on the enemy. Our losses are increasing rapidly. Two of our guns have been damaged by enemy fire."

While the young lieutenant was getting his breath the commander of the infantry company was summoned, and the cry which our infantrymen are so proud to hear went through the ranks: "Infantry forward!" The decision was soon made. A farther advance into this inferno would mean useless loss of blood. The company must be brought back. The increasing darkness favored this plan. "It is easiest to break off an engagement after a successful operation." The company must be relieved for a short while on at least one side. We accomplished this in an old, time tested German manner with a short, vigorous assault. We had to drive the rascals off of the hill over there on the right, from which they were pouring flanking fire into the ranks of the 1st Company, almost into their very backs.

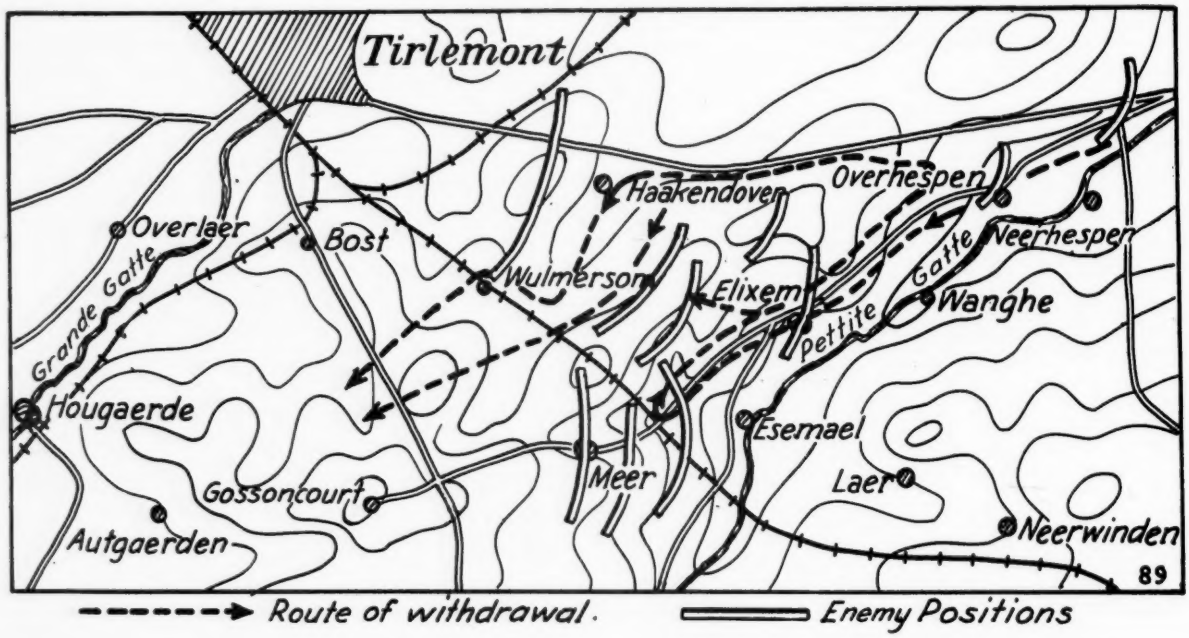
The command given to the Infantry Company and the 2nd Antitank Company was as follows: "The Infantry Company, supported by the 2nd Antitank Company will take the hill over there." How unpretending, how simple and Prussian, such a command sounds! But now we went through one of those moments of the war which cause the hearts of soldiers to beat more strongly in the midst of the hail of bullets and which will remain with us as proud and unforgettable memories. Although the news of the situation of the 1st Company had passed from man to man in a trice and although matters were not much better with the 2nd Company, our infantrymen advance, platoon leaders in the lead, quietly and in an orderly and matter-of-fact way toward the hill. The men of the 2nd Antitank Company changed the positions of their guns in order to cover the new objectives as calmly as if it were merely a practice maneuver and not a matter of life and death! Oh, the privilege of being able to go into the field of battle with such soldiers! — Heil Germany, the land of the soldier!

With the 1st Company up ahead, there occurred a bit of action characteristic of the German soldier. The senior sergeant called out: "Who'll go with me and bring the commander back?" The company commander, who had been shot down by the enemy, lay on the railroad right of way; shells were striking to the right and left of him, machine-gun fire was sweeping the area. Close to him lay an NCO who had tried to go to his assistance and who had been mortally wounded. The senior sergeant had not finished speaking before a sergeant and a cadet captain were beside him. Luck is with the brave. By crawling, these three managed to bring back not only the company commander but the noncommissioned officer out of the enemy fire.

When darkness settled down, the hill was in our hands and the 1st Company had been brought back without the loss of a single additional man. Fortunately for us, the oncoming darkness held our losses much lower than had been anticipated.

Now the infantry company and the 2nd Antitank Company were also drawn back and everything was removed from this wasp's nest to the Upper Hespen, a more favorable terrain. We planned to make a deep thrust into the enemy's flank the next morning, making this our point of departure. If we could not make it in a frontal attack, perhaps a surprise attack in the flank would do the work—that's the way our advance detachment works!

For the first time during this campaign, we assume our famous circular defense



formation—20 kilometers ahead of the divisional security in unknown, enemy terrain.

With troubled countenance the tireless radio detachment commander, Götz, announced that in spite of all he could do, he had been unable to make contact with the division for some time. Apparently, the distance had become too great. We simply had to get a report through to the division. The administrative officer had taken on himself the command of the bereaved 1st Company. There was nothing else to do but for the Adjutant to make his way by night through the enemy's country to the battalion's command post.

Sentinels were posted. Drivers filled their gas tanks, and during the course of this operation, as a last straw, the gas truck slipped into a ditch and overturned! The various commanders received a few short orders regarding the next day's activities and then—midnight had already passed—after 44 hours of marching and conflict, after 44 hours of the greatest tension, everyone sank into the deepest sleep. One is as if burned out at such a time. He is sustained only by iron will and the thought: you are a German soldier.

Man-Management

[Extracted from Lecture by Lieutenant-Colonel R. A. Mansell, O.B.E., *Royal Army Medical Corps, British Army.* Reprinted from *The Journal of the Royal Army Medical Corps* (England) August 1942.]

The first real difficulty which the soldier meets is the whole difference which there is in behavior, values, surroundings, almost everything, between civil and military life. In training the recruit in peace, much thought and time can be given to this; and it is handled by selected officers and NCO's. But in war there cannot be so much selection, nor is there time to spare; so we must realize, all the more, the strain under which many of our men are constantly living from this point of view alone. Purely on the sanitary side, too few of us really consider, in our civilian life, what a deal of trouble we are saved by those who think and work for us. It is not until we find ourselves in camp or on active service that we appreciate the blessings of a plug which can be pulled or of a dustman who calls regularly. Adaptation to this kind of life is unbelievably difficult for some. It is a biological truth that any living animal will perish rapidly as the result of the accumulation of its own refuse unless it takes active steps either to dispose of its "waste products" or to remove itself from them. The more lowly forms of life—the vegetables—do not suffer from this disability; on the contrary, they flourish the more as the result of it.

There is a type of mentality which can not only busy itself in these so essential conservancy duties but also can even take pride in their proper performance. Men are to be found who can make a life job of the burning of manure and like the business. If we can get such a man into our sanitary squad we can rest assured that the work will be well and thoroughly done. However, there are equally many men, especially in our present Army, to whom such employment may be a source of such mental trauma as to leave not only the work ill-done—and we know how dangerous to others that may be—but also themselves definitely decreased in efficiency as members of the military machine. There is no need to have round pegs in square holes if we will but take a little trouble to measure men up.

The one thing which the private soldier does not have and cannot have—unless we give it to him—is (paradoxically enough) privacy, even for a few minutes, in which to lead his own private life. There is an enormous value from this point of view in the reading or writing room, the quiet room of the institute, the canteen or the club where a man can sit and think to himself, or even just sit; where he can write and read his letters to and from his home, his wife, his children, his girl. Incidentally, do you know who, and how many, there are in relation to the men under your immediate command—your children? You ought to. And what their worries are; God knows we all have enough in these days; but we, perhaps, can deal with ours and get help in them more easily than the private soldier can unless we ourselves go out of our way to help him, to learn his personal life and to listen to, and occasionally advise, him in his troubles. Though we may not be able to give any active help, it's amazing—and we each know it ourselves—what a relief it is to be able to get a worry off one's chest before someone to whom we look up and who will listen sympathetically. After all, as a general rule we are not asked to make any world-shaking decisions; for it's the little worries that give the worst trouble—little things which, were we at home with the family and face to face with them, would be brushed aside with scarcely a thought but which, when we're away, prick and prick till they make a wound, the origin of which often we can barely remember until we have talked the whole thing out with someone who will listen. This sort of thing was, I am told, well exemplified in our men who were brought back from Flanders broken, at the time, with what in the last war we rashly called "shell-shock." Essentially at the back of most of these men's trouble there was a worry, often so small and, when revealed, in itself so silly as to be with difficulty recognizable in quieter times as a real worry at all. But, added to other and greater stresses, it became the counterpart of the proverbial straw on the long-suffering camel. Men worry over missing just that letter which was to tell them whether little Dick did catch the measles from Nellie—"Never strong in his chest, was Dick." The proof of these things was a recovery rate unexpectedly high in comparison with previous similar experience.

Talking about letters: how long does it take to distribute letters in your unit? Every man knows when the post corporal gets in with them; but does the man who is waiting for important news—and all news of his family is important in these days—does he get his letter with the promptitude with which we get ours in the Mess, or does it take hours to reach him through many inquisitive or uninterested hands? It is a point worth looking into.

In your unit can a man say, as he enters the dining hall, "Brown stew and rice pudding — must be Monday"? Or, conversely, because it is Monday does he know that he is going to hate his dinner because it will be brown stew and rice pudding? With all the difficulties which there are in these days in the matter of rations and the arrangement of diet sheets, both from the issue and the receipt point of view, isn't it just as easy to plan our dietaries, so far as we can at all, on an eight or ten day basis as on the customary seven, so that a man can't tell what day of the week it may be by what he sees on his plate, or vice versa? Monotony has killed almost as much good food as have cooks, and it is worth while taking any trouble to escape from it. Listen to Wavell:*

"Discipline apart, the soldier's chief cares are: first, his personal comfort—i.e., regular rations, proper clothing, good billets and proper hospital arrangements (square meals and a square deal, in fact): and secondly his personal safety—i.e., that he shall be put into a fight with as good a chance of victory and survival as possible. Guns and butter, in other words. And it may be remarked that Russian morale in the late war broke through lack of guns, German lack of butter."

There are now, and the peculiar conditions of modern war make it necessary that there should continue to be, many small, isolated garrisons scattered over the countryside where men have to remain often on almost continuous hours of duty for long tours at a stretch. Many of these posts are located so far out in the country that there is little possibility of intercourse with the world at large, even if there were the time or opportunity for it. Our defense and the defense of our families depend very greatly on the men in these posi-

* Wavell, General Sir Archibald. *Generals and Generalship.*

tions. Now people like you and I with a reasonable degree of education, are able, to some extent at any rate, to relieve ourselves of the monotony of such situations: we have the ability and training to find recreation in our surroundings and even in ourselves. But the man of little or no education has not this ability: he has not even the possibility, unless we help him. Many of us may find it difficult to appreciate the outlook of a man recently relieved from such a situation whom one of his officers met the next evening in the town. To a casual inquiry as to how things went the man replied, "Grand, Sir, I've been having a good walk around and I haven't seen a blade of that bleeding grass in over an hour." And if you haven't met before the objection of the slum child to the country—that you can't play hopscotch on grass—you can't begin to realize the strain of the terrible monotony of these places on the uneducated townsman. I've been laughed at time and again for the suggestion, but I continue to make it because I know it has worked, that you can relieve this monotony for these men and therefore improve their fighting efficiency by teaching them the simple arts of the countryside—even to bird-watching and the collection of wild flowers.

A great many of us are suffering, or think we are suffering, from the monotony of things at the present time. Training-training-training; move - move - move; same sort of thing week after week; and no fighting, which was what we thought we had been brought into the Army for. We are apt to forget—and if we do so, how much more do the men—how long it really does take to make a soldier fit to win a modern war. And we are very apt to forget, also, that Hitler once boasted that he would defeat the French army by not attacking it—by letting it rot, so to speak, in its own juice. Can we say that he did not do just this thing? We must not go that way.

As a relief from the monotony of mere training, games have an inestimable value, apart altogether from their importance in the building up of a unit's solidarity; but, of course, as many men as possible must play them—and as many officers, with the men, as have not reached the years when such exertions are not really good for their continued health. There is a time in life when it is far wiser to watch such activities than to take active part in them. Even at that time one can watch, criticize, and encourage. It is rather surprising how many sports grounds one can visit and see men playing, and playing hard, without ever an officer even looking on. You realize what a difference the personal interest of an officer does make to all of the men's activities. And how he does appreciate that an officer should play games with him? He's not a stern critic; he realizes just as fully as do you and I that everyone cannot be first class, and that the mere fact that one is an officer does not not necessarily mean that one is unbeatable with bat or ball. It is the sharing of things with some one to whom he looks up that he values. And, though it may sound strange, it is the fact that an officer can and does share things with his men which does keep him, in their eyes especially, above them as someone to whom they look up and to whom they continue to look up even in the direst emergency. I venture to suggest that it is just this ability to share our men's recreations and pleasures equally with their trials and troubles—a condition which has always, more or less, been a basic part of British soldiering, and is rather peculiar to it — which has accounted for the success, both in victory and defeat, of British arms. Let us not forget the trials and troubles while we're thinking of games. I have seen a battalion on the march with the men in their plain battle dress and full equipment and their officers wearing waterproofs and overcoats; true it was a miserably damp, cold day; but that is no reason why any officer should advertise to his men and to the world at large that he is less able or prepared to endure such minor discomforts than they are.

Everyone knows the value of sleep and the importance which is attached to "nights in bed." When men have had to miss some or all of the sleep-time due to them it should be understood that we are right in insisting that some, at least, of that loss should be made up to them from the point of view of giving their bodies and minds rest in which to make good, to grow, and to repair breakdown. But this time of rest, the hours of sleep, is the one portion of the soldier's daily life which he has really privately, all alone, to himself, and that sleep has an added and special value from that point of view.

"Man-management" is, after all, in the main a matter of details; and what it really boils down to is getting the best you can out of your men by doing the best you possibly can for them in all circumstances.

In the course of conversation with an officer recently, he told me that he had noticed one great difference between this war and the last; and he wore on his battle dress the evidence that he had served with distinction both in the ranks and as an officer in that unfortunate disturbance and so might be held to be justified in comparing it with this in the matter in question. He said that in the last war the great majority of the officers under whom he served and whom he met were leaders; whereas now most seemed to him to be drivers. I suggest that though a driver goes, normally, behind those whom he sets in movement, when it comes to the real trial and the bad spot, the driver of men is apt to get a shot in the back and the leader, though he be in front, to be carried through hell and back again with the job safely done. I have been asked whether the present system of recruitment — conscription as against volunteering—doesn't call for the driver rather than the leader type of officer. Honestly, I fail to see why. No mere accident of birth—or breeding—let alone any man-made law, can alter the fact that "a man's a man for a' that," which is one of the most important of those things for which we are now fighting. Does the fact that a man's actions are governed, in this respect, by the law of the land rather than being left to his own free-will make him any less of a human being or less deserving of being treated as such; or further, less likely to respond to such treatment?

As a broad general statement, if you study history—and biographies as the most interesting and possibly the best way of doing this—you will come to the conclusion that the one characteristic which is common to all great leaders, to all really good soldiers, has been not a knowledge of tactics, not a skill in strategy, not even an ability to deal with politicians, but simply an intense understanding and an intimate knowledge of the private soldier. John Buchan† has put this supremely well in writing of Julian Byng.

> "There can have been few commanders who were more rapturously adored by their men, and it was because of his rich understanding of humanity, what in Scotland is called 'innerliness' and not because of any genial slackness, for he kept a tight rein on discipline . . . he talked to every man as if he were a blood relation."

It is the result of this that we see in that magnificent retort of Wellington at Waterloo. That battle, you will remember, went badly for the British and their allies, so badly that the spectating diplomats who gathered round the supreme staff expressed, in plain terms, their conviction that it was high time that what could still be saved of men and material should be withdrawn before it was utterly smashed. They received the blunt reply—"My army and I know each other exactly, gentlemen. The men will do for me what they will do for no one else."‡ And Wellington rode down into the fighting squares. True, if you like, that Wellington spoke few fair words to or of his soldiers; he may have blackguarded them to their faces, and behind their backs, in his orders and in his despatches; but he did insist, before all things else, that they

† Buchan, John. *Memory Holds-the-Door.* Hodder and Stoughton, Ltd., 1940.

‡ Heyer, Georgette. *An Infamous Army.* Wm. Heinemann, Ltd., 1937.

had what we have already called their "guns and butter."

Listen again to Wavell:*

> "The relationship between a general and his troops is very much like that between a rider and his horse. The horse must be controlled and disciplined and yet encouraged; he should, according to an old hunting maxim, be cared for in the stable as if he were worth five hundred pounds and ridden in the field as if he were not worth half a crown. And the horse knows not only by his own comfort whether he is being ridden well or badly but he knows if his rider is bold or frightened, determined or hesitating."

Again:

> "the success of a leader is the degree to which he makes himself dispensable and teaches his disciples to do without him and fend for themselves."§

And listen to that writer of the last war quoted by Wavell:—

> "A man does not flee because he is fighting in an unrighteous cause, he does not attack because his cause is just; he flees because he is the weaker, he conquers because he is the stronger —or because his leader has made him feel the stronger."

When you get back to your units and start talking of this sort of thing you will rouse those who will tell you bluntly that you've forgotten that there is a war on; that while we have still so much training to do there is no time for these high-falutin' ideas—and, anyway, that this is 1941 not 1914. This war is different.

I am tired of hearing that last phrase because so few of those who use it really understand why and in what respect this is different from all other wars in which we have been engaged. We, and other peoples have been up against world-conquerors and would-be-world conquerors before; and each of them has "invented" some "new weapon" which, when we look at it, is but some new method of employing, arming, or moving the old weapons — men. Alexander, with the Macedonian phalanx; Caesar, with his legions; Genghis Khan and Tamerlane, with their use of amazingly mobile speed and mass terrorization—this "Panzer" game has been played before; Napoleon — there's nothing really new about it all; we can see the principles of Field Service Regulations clearly carried out down the ages by the successful ones. And this island has been invaded before, time and again, and has survived—even gained—from those ordeals. But what is different in our experience, at any rate, is that we are now facing an opponent whose intention is, and he has expressed it plainly, the obliteration of the British race—no less. Total obliteration, save for such few of our womenfolk as display sufficiently marked Nordic characteristics to be worthy to be used as brood mares for certain of his lower classes; for the remainder—men, women and children—slaughter or sterilization and the slave labor camp. That is what we are up against and that is where this war is different from all others that have gone before. What is going to defeat that? Machines? Machines don't move themselves or fight of themselves.

> "The man is the first weapon of battle; let us then study the soldier in battle, for it is he who brings reality to it. Only study of the past can give us a sense of reality, and show us how the soldier will fight in the future."‖

The common private soldier . . .

Some people will tell you that this is not Hygiene, which I am supposed to be teaching you, but some other and quite different thing, not my job at all. I would remind them that

> "Hygiene is the study of man rather than matters. The study of the development of the soldier is more important than the study of the disposal of his faeces."¶

To us in the Medical Service of the Army, the sound man, not the sick, is the important one because, little though many realize it or give evidence of so doing at times, an army exists to go to war and not to go to hospital. The "prevention of disease" is the larger part of our business and duties; but we must go further than that towards the "maintenance and promotion of health."

We can go on, too, to better things than war; we can take with us something for the days to come — man-management — the art of getting the best out of those placed and working under us by doing the best we can for them; not only in the large matters of sanitation and environment, housing, feeding, clothing, work, and play; but also, and often especially, in the small matters that become so largely important in the production of peace and happiness. "Freedom from fear is the beginning of wisdom."§ Make no mistake; this will be a hard battle if we undertake it.

> "The forces of reaction, which fought Disraeli in 1875, will rally to curtail health activities in the future for exactly the same reason—that the country cannot afford it. Those who believe, on the other hand, that the country cannot afford disease and death will require to arm themselves with exact knowledge of all the manifold conditions of healthy living in order to defeat the campaign which will be launched after the war to diminish the activities of the public health services."**

Can't you take our hygiene of the field and the barrack room, which we have been trying to teach you, on even into the higher spheres of civil life, and realize that our "chain of infection" — "source-route-destination"—can be applied equally to the social, mental and, if you like the word, psychological difficulties of our fellowmen? We are not just wasting our time here; we can be learning the highest arts of peace through the trials of war.

When we have become really conscious that no man can suffer alone—that every man's sufferings and privations are part of the body politic that they react on and remain as sources of infection of the remainder of his fellows; and when we have persuaded ourselves by simple trial how essentially easy it is, first to interrupt the passage of an infection, then to aid the recovery of the sufferer and to protect the still healthy if only we will all work together, isn't there something very much better than anything past which we can put, and keep, in our view as the brave new world which we will rebuild?

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§ Wedgwood, The Rt. Hon. J. C. In a B.B.C. Broadcast on April 19, 1941.

‖ du Picq, Ardant. Quoted by Wavell.

¶ Anderson, Lieutenant-Colonel J. A., when Professor of Military Hygiene, R.A. Med. Coll., London, 1924.

** From a review of Fraser and Stallybrass's *Textbook of Public Health*, Tenth Edition, 1940.

Book Reviews

THIS IS THE ENEMY

By Frederick Oechsner

354 pages . . . Little, Brown

Although authorship of this book is credited to Mr. Oechsner, central European manager of the United Press, it is a collaboration of himself and his U. P. Berlin staff, planned during their five months' internment in Germany, following the outbreak of war between Germany and the United States. Each member of the staff was an experienced reporter of the Nazi scene and each has written that portion of the book pertaining to his specialty. As a mutual job it is not only readable, it is a valuable estimate of Nazi-dominated Europe made by men who were thoroughly familiar with it to the very last minute.

Written in four sections, the book describes the men who direct German life and policies—their abilities, jealousies, and weaknesses; German military technique as it developed across the face of Europe as seen first hand by trained reporters; the German home front; and Europe under the Hitler fist. It is not a savory story, and for that reason is of special import to this country which, in the opinion of the writers, still does not understand what it means to live under the Nazi yoke.

NOTES ON COMBAT TRAINING

By Brigadier General Louis R. Esteves, U.S.A.

199 pages . . . The Military Service Publishing Co., Harrisburg, Pa.

From the various training manuals, publications of the Infantry School and Army Correspondence Courses General Esteves has compiled a volume which should prove highly useful to officers. Particularly adapted as a source of instructional material, the book consists of notes on subjects which come up in the daily routine of training of troops. The material is well organized and classified and reflects the diligent research and study which the author has put into it.

SOVIET RUSSIA'S FOREIGN POLICY 1939-1942

By David J. Dallin.

452 pages . . . Yale University Press, New Haven.

The opening sentence to the book's introduction, quoting Mr. Winston Churchill in that "Russian policy is wrapped in a mystery inside an enigma . . ." sums up in one sentence the feelings which for a long time have troubled the English speaking countries. For the policies of the Soviet Union towards the rest of world have been at times indeed most enigmatic and incomprehensible to the West, despite repeated assurances from Moscow as to their unequivocal nature.

Now we have a clear and, what is more important, an objective study of this vastly important question by an author whose knowledge of the subject is profound and who drew upon an enormous bibliography, both Russian and non-Russian, for the background of his information. The result is a scholarly work which, step by step, takes the reader from the spring of 1939, i.e., the period immediately preceding the German invasion of Poland, up to and including the futile German action at Stalingrad.

The author draws no conclusions, rather he lets the reader do this for himself, from the mass of material gathered and collected.

As a competent study of the foreign policies of our Russian ally in the war against the Axis, Mr. Dallin's book represents truly worth while reading for all thoughtful people.

IDENTIFICATION

The World's Military Naval and Air Uniforms, Insignia and Flags.

300 Pages . . . The Military Service Publishing Co., Harrisburg, Pa.

This is a very useful volume in which are compiled the most pertinent data on uniforms and distinguishing insignia of the major countries. Along with it, the handbook includes general information, other than military, on the countries themselves and very serviceable tables of foreign equivalents of American military terms in a number of the principal languages.

With American forces serving in far-flung corners of the globe, this handbook will be welcome to Army personnel as a practical and timely guide.

SIBERIA

By Emil Lengyel

416 Pages . . . Random House, New York.

From the opening to the closing chapters this very meritorious work on the vast Asiatic territories of the Soviet Union will hold the reader's interest. This immense continent has been endowed by nature to play an important part in the shaping of Russia's destiny. Siberia's role as a reserve pool of Soviet Union's resources has been brought forth by the German invasion of Russia with the consequent shifting of much of the industrial production of the U.S.S.R. to the Urals and beyond. As the war progresses, Siberia's part in Russia's struggle against Nazi Germany will grow.

Emil Lengyel, who is best known as a writer on international affairs in such first-rate publications as the *New York Times*, contributes a valuable study on this important region. He takes the reader through the varying climate, the history of Russian colonization, native tribes, vast natural resources, the building of the trans-Siberian railroad, the Russo-Japanese war of 1904-05, the turbulent years of the Russian Revolution, and the development of the region under Soviet management. Withal he draws a fascinating picture of this relatively unknown land.

The proximity to Japan of much of the Russian Far Eastern coastline, and the present and potential value of Siberia to the U.S.S.R., should qualify this book as highly useful reading for our military personnel.

I SAW THE FALL OF THE PHILIPPINES

By Colonel Carlos P. Romulo

323 pages . . . Doubleday, Doran

Colonel Romulo, editor and publisher of a large chain of Philippines newspapers, served on General MacArthur's staff throughout the Luzon campaign and, because the Japs had a price on his head, was evacuated from Bataan the night before the peninsula fell. This is Colonel Romulo's personal story of the tragic conquest of his native islands, told with feeling and vivid color which had previously won him a 1941 Pulitzer Prize. It is absorbing but not very comfortable reading.

The account begins with a swift review of Colonel Romulo's trip through the orient on the eve of war, in which he contrasts native feeling in other areas with that in the Philippines. It describes the days in Manila between December 8 and the evacuation of the city, then shifts to Bataan and Corregidor during the siege. It closes with a dramatic account of the author's escape during the confusion of the final collapse of Bataan's defenders.

REPORT FROM TOKYO

By Joseph C. Grew

88 pages . . . Simon and Schuster, New York.

Mr. Joseph C. Grew, career diplomat in the American Foreign Service, was our Ambassador to Japan from 1932 until the Nipponese attack on Pearl Harbor. He thus had an unusual opportunity of observing and reporting to our Government the gradual and unmistakable moves by the ruling clique in Japan leading towards war with the United States. That this trend was being followed in the Japanese foreign and military policies Mr. Grew saw with a remarkable clarity.

The book is highly recommended not only to military personnel, who should read it for the sake of better understanding of the enemy and his aspirations, but to all thoughtful people, as well.

WHAT THE CITIZEN SHOULD KNOW ABOUT WARTIME MEDICINE

By Lieutenant Colonel Joseph R. Darnall, M. C., and V. I. Cooper

237 pages . . . W. W. Norton & Co., New York, N. Y.

While this work primarily initiates the civilian into the multilateral activities of the Medical Department of the Army and the countless problems which the Army doctor is called upon to handle, it is, at the same time, a splendid source of information on the subject also for military personnel other than medical.

Of particular interest to the military reader are chapters dealing with military sanitation and hygiene, military psychiatry, communicable diseases, the venereal problem in wartime, air medicine, and other subjects which at some time during an officer's service may arise within his own organization.

Library Bulletin

BOOKS ADDED TO THE LIBRARY SINCE APRIL 1943

ABEND, HALLETT. — **Pacific Charter.** Our destiny in Asia.

BIEBER, RALPH P. (Edited by). — **The Southwest Historical Series.** Index.

BIRDWELL, RUSSELL. — **Women in Battle Dress.**

BORKIN, JOSEPH & WELSH, CHARLES A. — **Germany's Master Plan.** The story of industrial offensive.

BROCH, THEODOR. — **The Mountains Wait.**

CRAF, JOHN R. — **Second Lieutenant's Handbook.**

Current Biography. Who's News and Why.

DUTT, PALME R. — **British in the World Front.**

Federal Reporter. Second Series, Vol. 131 F. 2d

Fighting on Guadalcanal. 1943.

FULLER, J.F.C. MAJOR GENERAL. — **The Decisive Battles of the U.S.A.** The military history of the United States between the days of Washington and Pershing.

Glossary of Abbreviations Used in the British Armed Forces. (Official & Non-Official).

GOLDENRING, M., VOORHEES, N.A. & SUAREZ, T. — **Going to Officer Candidate School.** The guide to every officer candidate school.

HAMILTON, THOMAS J. — **Appeasement's Child.** The Franco regime in Spain.

HIRSHBERG, HERBERT S. — **Subject Guide to Reference Books.**

JUSTROW, KARL. — **The Commander and Military Science.**

MACCORMAC, JOHN. — **This Time For Keeps.**

MILITARY RAILWAY SERVICE. U.S.Army. — **Railways of Portugal, Spain & Southern France.**

MANSERGH, NICHOLAS. — **Britain and Ireland.**

MATTHEWS, WILLIAM & WECTER, DIXON. — **Our Soldiers Speak, 1775-1918.**

MIKSCHE, F.O. — **Paratroops.**

MYKLEBOST, TOR. — **They Came As Friends.**

NAVY DEPARTMENT. — **United States Wars with the Barbary Powers.** Vol. IV.

NICOT, GEORGES. — **Blitz French.** A handbook of action French for the fighting forces.

O'LEARY, EDWARD J. SERGEANT. — **Semi-Private. Or how to be a soldier in ten easy lessons.**

PACKARD, REYNOLDS & ELEANOR. — **Balcony Empire.** Fascist Italy at war.

Political Handbook of the World. 1943.

PUTNAM, WILLIAM C. — **Map Interpretation with Map Applications.**

REYNOLDS, QUENTIN. — **Dress Rehearsal.** The story of Dieppe.

SCHOOL OF FOREIGN SERVICE. — **The Political Economy of Total War.** An essay on geopolitics.

SMITH, CLEVELAND H. & TAYLOR, GERTRUDE R. — **United States Service Symbols.**

SMITH, ELLEN HART. — **Charles Carroll of Carrollton.**

TAYOE, A. — **Military English-Russian Dictionary.**

TOLISCHUS, OTTO D. — **Tokyo Record.**

Directory of Periodicals

Included in this directory are only those periodicals from which articles have been selected. See also "List of Periodicals Indexed and Key to Abbreviations."

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Catalog of Selected Periodical Articles

This section catalogs the articles selected from Library periodicals from March 15 to April 15. Periodicals in this catalog are arranged alphabetically.

AEROPLANE (Great Britain)
22 January 1943

RUSSIAN LONG-RANGE BOMBING. Lieut. Colonel Nicolai Denisov
"COASTAL COMMAND"

ARMY ORDNANCE
March-April 1943

THE ARMY GROUND FORCES. Lieut. General Lesley J. McNair
LEND-LEASE. Major General C. M. Wesson
ORDNANCE IN ACTION. Colonel Harold J. Conway

ARTILLERISTISCHE RUNDSCHAU (Germany)
January 1943

WITH A HEAVY FIELD HOWITZER BATTALION BEFORE THE STALIN LINE.
[Mit einer s.F.H. Abteilung vor der Stalin-Linie.] Lieut. Colonel Kreppel
DIVISION OF TASKS AND COOPERATION IN THE OBSERVATION POST
[Aufgabenverteilung und Zusammenarbeiten auf der Beobachtungsstelle.] Captain Richtsteig
WELL-PLANNED COOPERATION BETWEEN INFANTRY AND ARTILLERY.
[Wohlüberlegte Zusammenarbeit zwischen Infanterie und Artillerie.] Lieut. Colonel Vogt.
THE MARCHING COMPASS AND ARTILLERY.
[Marschkompass und Artillerie.]

CAVALRY JOURNAL
March-April 1943

SOVIET CAVALRY, 1918-1943. Colonel General O. I. Gorodovikov
RED CAVALRY
AIR SUPPORT IN TUNISIA?
ORGANIZATION OF A TANK ATTACK. Captain A. Bandik
WINTER ATTACK BY SMALL UNITS. Captain Shumilov
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Aero = Aeroplane (Great Britain)
A Ord = Army Ordnance
Art Rund = Artilleristische Rundschau (Germany)
Cav Jour = Cavalry Journal
CA Jour = Coast Artillery Journal
An Cos = An Cosantoir (Ireland)
Defensa = Defensa (Mexico)
FA Jour = Field Artillery Journal
Inf Jour = Infantry Journal
Jour USII = Journal of the United Service Institution of India (Great Britain — India)
MC Gaz = Marine Corps Gazette
Mil Eng = Military Engineer
Nav Inst Proc = Naval Institute Proceedings
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GENERAL

Amer For Serv = American Foreign Service Journal
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Collier's = Collier's
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Cur His = Current History
Fortune = Fortune
Harper's = Harper's Magazine
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JUN 7 1913